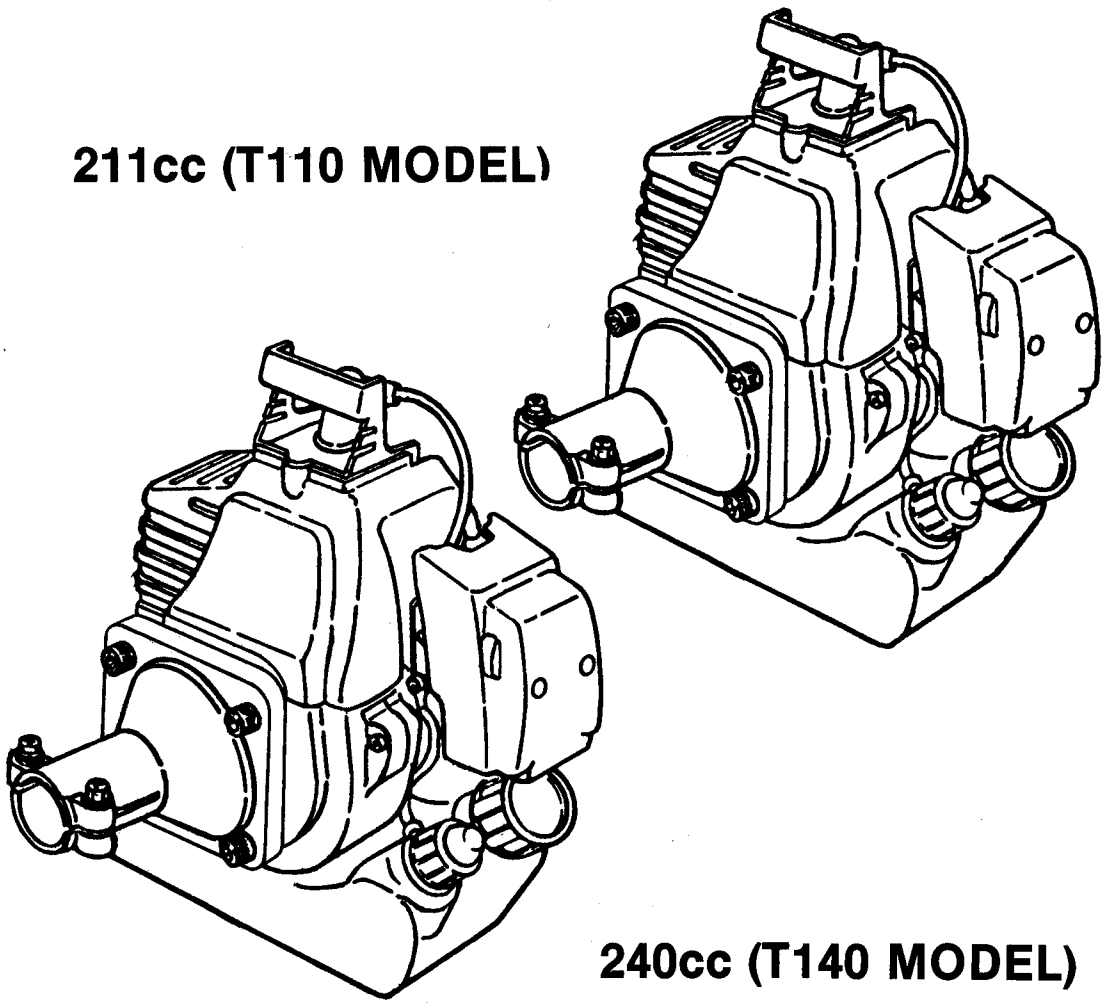
# Service Manual for

# SNAPPER®

# MODEL 210 & 240 TRIMMER ENGINES



211cc (T110 MODEL)

240cc (T140 MODEL)

This manual covers the recommended overhaul and repair procedures for the engine models used on Snapper Model 210 & 240SS Trimmers. The engines are identical in appearance but have internal differences. The engine powering the 210SS is a Mitsubishi model T110 while the 240SS engine is a Mitsubishi model T140. This manual has been reproduced in part from the Mitsubishi manual covering these two models plus a model T180 which is not at present used on Snapper Trimmers. An explanation of the Mitsubishi model designation is found on page 1 of the manual.

**SNAPPER POWER EQUIPMENT**
McDonough,GA•30253

A FUGUA INDUSTRIES Company

**MANUAL #07315 (9/86)**

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# 1. SPECIFICATIONS

240

| ITEMS \ MODEL | T110P–D | T140P–D | T180P–D |
|---|---|---|---|
| Type | Air-cooled, 2-stroke cycle gasoline engine | ← | ← |
| No. of cylinders – Bore × Stroke (mm) | 1 – 30 × 30 | 1 – 32 × 30 | 1 – 36 × 32 |
| Displacement (cc) | 21.2 | 24.1 | 32.5 |
| Continuous rated output (PS/rpm) | 0.85/7000 | 1.0/6100 | 1.3/6000 |
| Max. output (PS) | 1.1/8000 | 1.4/8000 | 1.8/7000 |
| Max. torque (kg·m/rpm) | 0.108/6500 | 0.15/6000 | 0.20/5500 |
| Engine rotation | Counter-clockwise | – | – |
| Fuel | Mixture of gasoline and lubricating oil (Mixture ratio; 20 ~ 25 : 1) | ← | ← |
| Fuel tank capacity (ℓ) | 0.5 | 0.6 | 0.9 |
| Lubricating oil | 2-cycle motor oil | ← | ← |
| Carburetor | Diaphragm type | ← | ← |
| Ignition system | Breakerless ignition type flywheel magneto (MTI) | ← | ← |
| Spark plug | NGK BM–6A | ← | ← |
| Starting system | Recoil starter | ← | ← |
| Lubrication | Mixture oil with fuel (petroil lubrication) | ← | ← |
| Dry weight (kg) | 2.2 (2.4) | 2.3 (2.5) | 2.7 |
| Dimensions (Length × With × Height) (mm) | 152 × 202 × 238 (211 × 202 × 238) | 152 × 209 × 242 (211 × 209 × 242) | 159 × 224 × 264 |

Note: (1) The above specifications are subject to change without prior notice by the manufacturer for the purpose of improvements.
(2) The speed (rpm) indicates a mesured value at each output shaft.
(3) The figures in the parenthesis indicate the values of the clutchcase one piece type engine respectively.

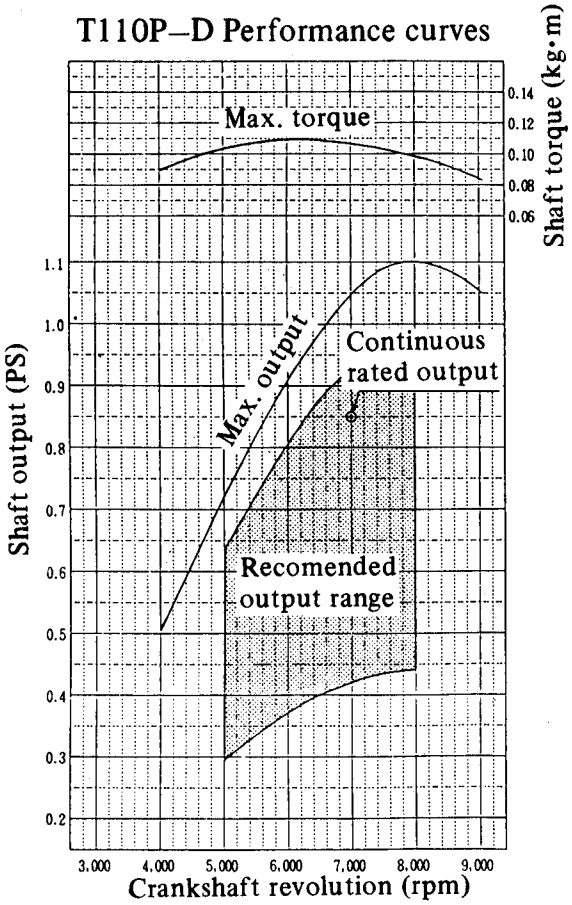
**Explanation of indication**

T 140 P F D – 01

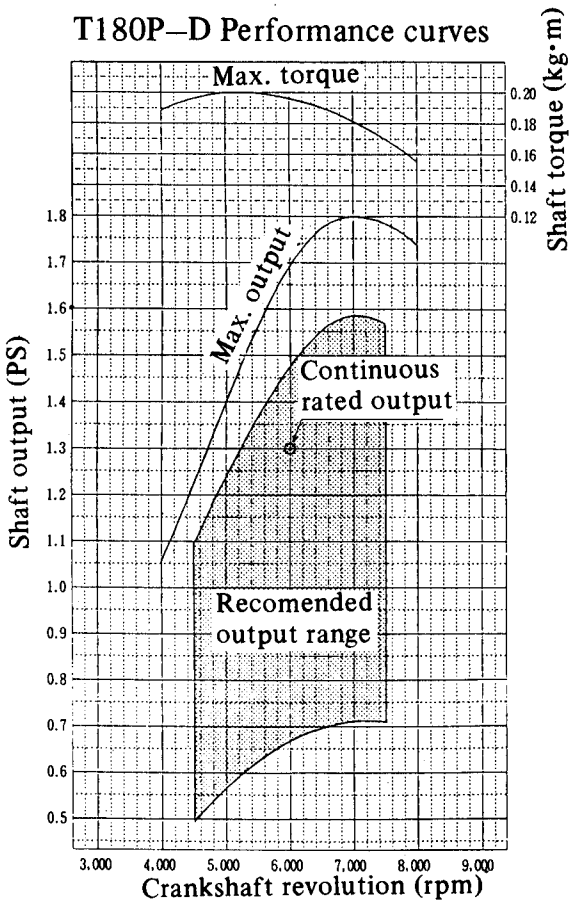
- 01 — Special specifications ..... Customer code No. : 001 ~ 999
- D — Specification (Fuel system) ..... D: Diaphragm type carburetor F: Float type carburetor
- F — Type ..... F: Flange type, D: with clutch drum, S: Shoulder type trimmer
- P — Rotating direction ..... P: Counter-clockwise; direct connection M: Clockwise; direct connection
- 140 — Output ..... Maximum output multiplied by a hundred
- T — Major classification ..... 2-cycle engines initials (TWO cycle engine)

## 2. PERFORMANCE

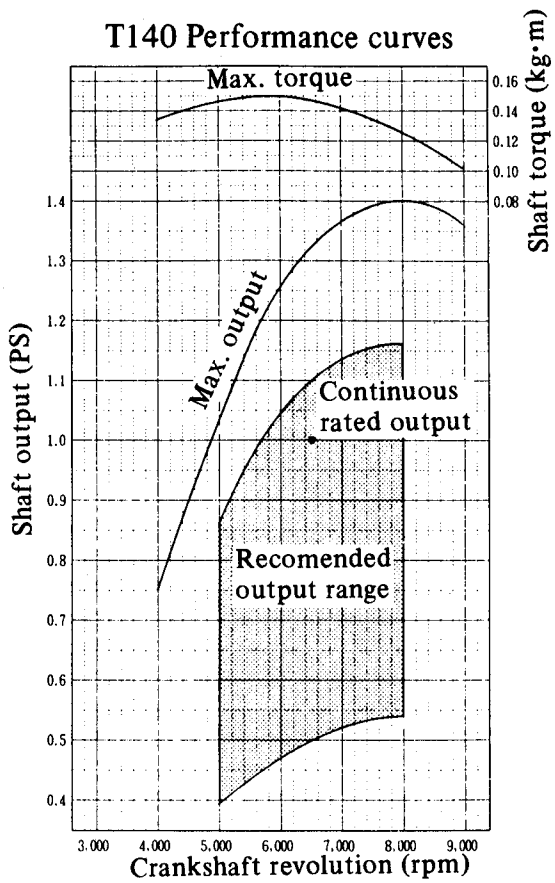
T110P–D Performance curves


Max. torque
Max. output
Continuous rated output
Recomended output range
Shaft output (PS)
Shaft torque (kg·m)
Crankshaft revolution (rpm)
3,000 4,000 5,000 6,000 7,000 8,000 9,000
0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1
0.06 0.08 0.10 0.12 0.14

T180P–D Performance curves


Max. torque
Max. output
Continuous rated output
Recomended output range
Shaft output (PS)
Shaft torque (kg·m)
Crankshaft revolution (rpm)
3,000 4,000 5,000 6,000 7,000 8,000 9,000
0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8
0.12 0.14 0.16 0.18 0.20

T140 Performance curves


Max. torque
Max. output
Continuous rated output
Recomended output range
Shaft output (PS)
Shaft torque (kg·m)
Crankshaft revolution (rpm)
3,000 4,000 5,000 6,000 7,000 8,000 9,000
0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4
0.08 0.10 0.12 0.14 0.16

These performance curves are based on B8013 in JIS. and indicate the values of the engine equipped with the standard attachments.

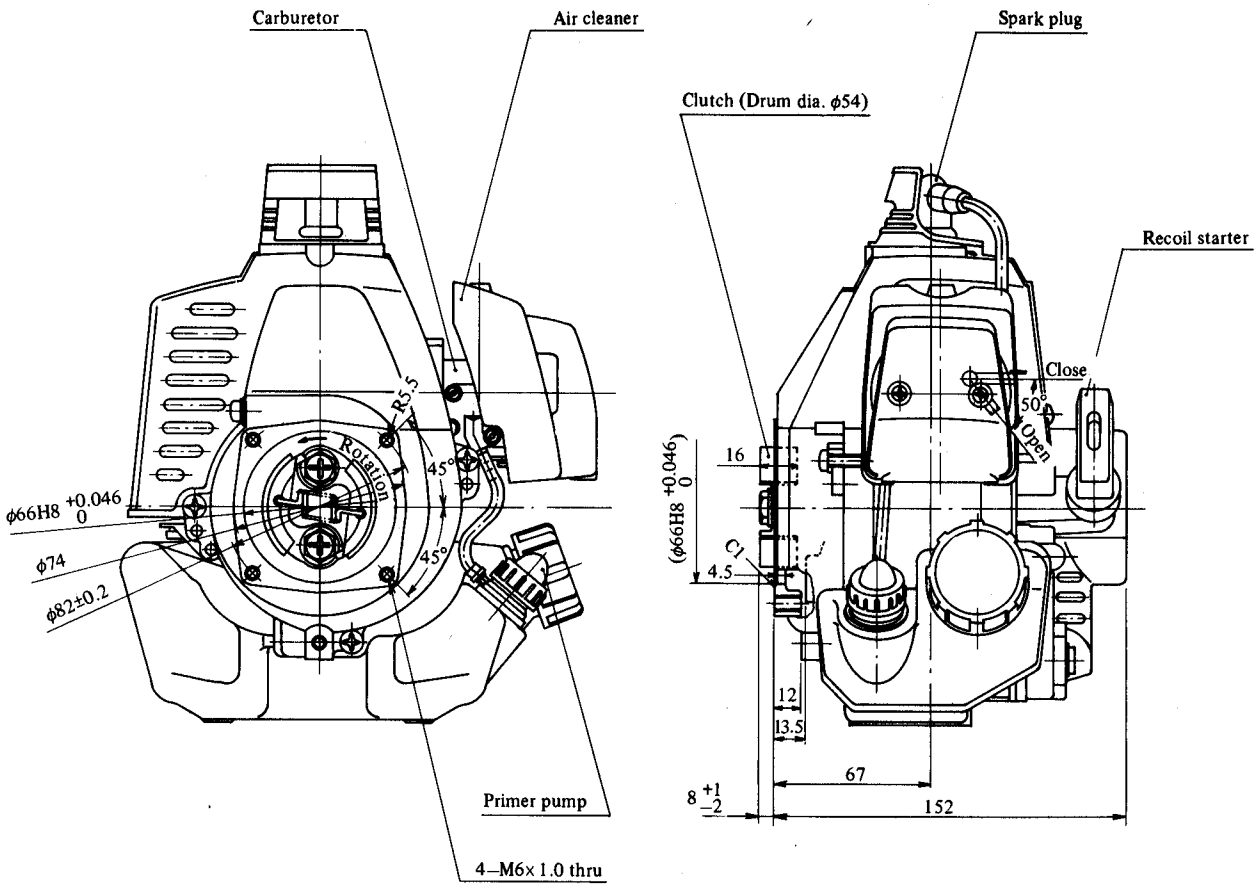
(1) Max. output means the output produced when the engine is completely run-in and the throttle valve of the carburetor is fully opened.

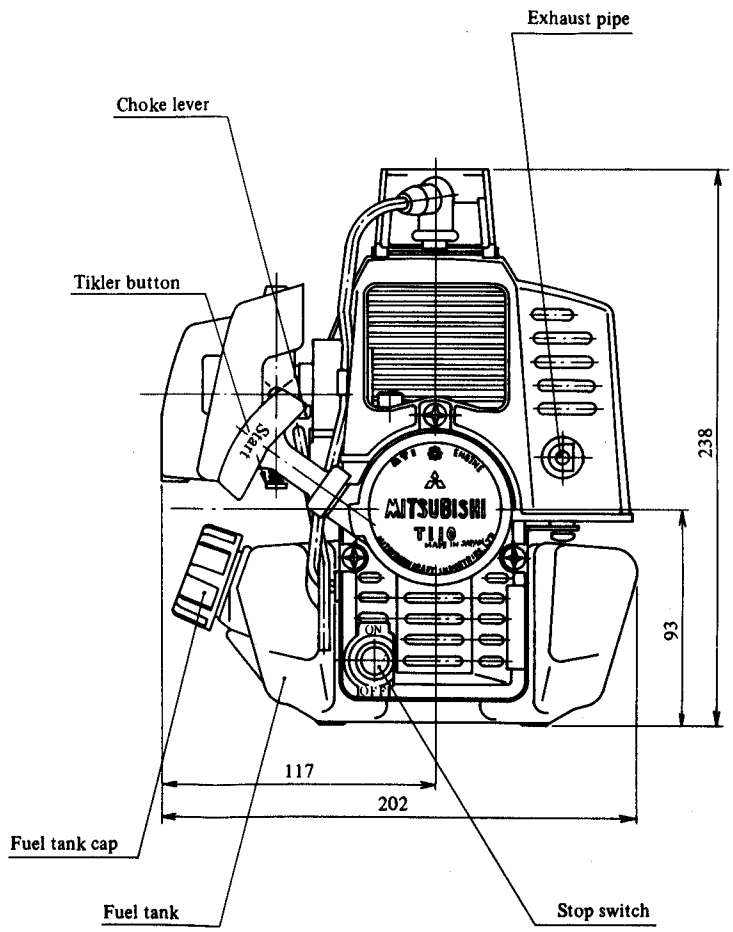
(2) Continuous rated output means the output level which can be obtained continuously, and the manufacturer recommends the level because of the high efficiency and the durability of the engine.

(3) Max. torque means the driving torque produced when the engine is fully run.

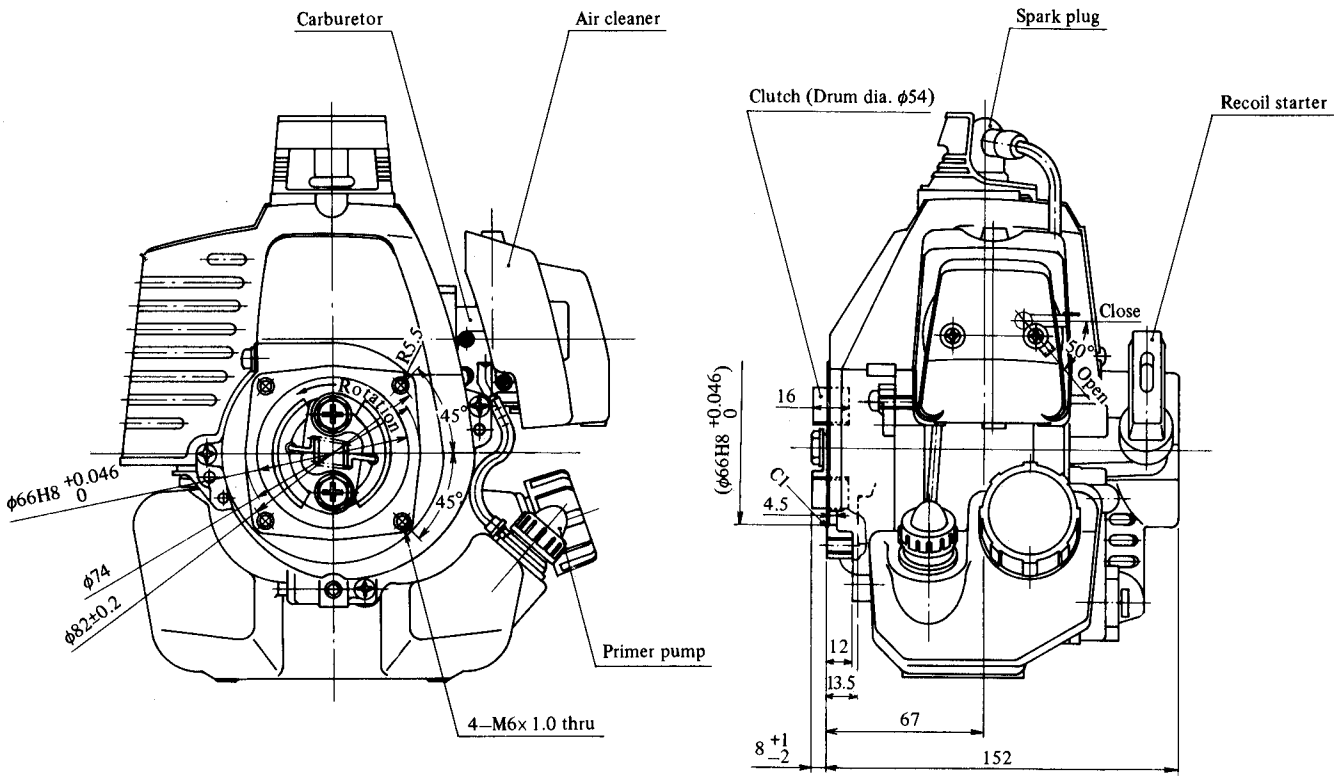
(4) These performance curves are based upon JISB8013 and indicate the measured values of the engines equipped with the standard attachments.

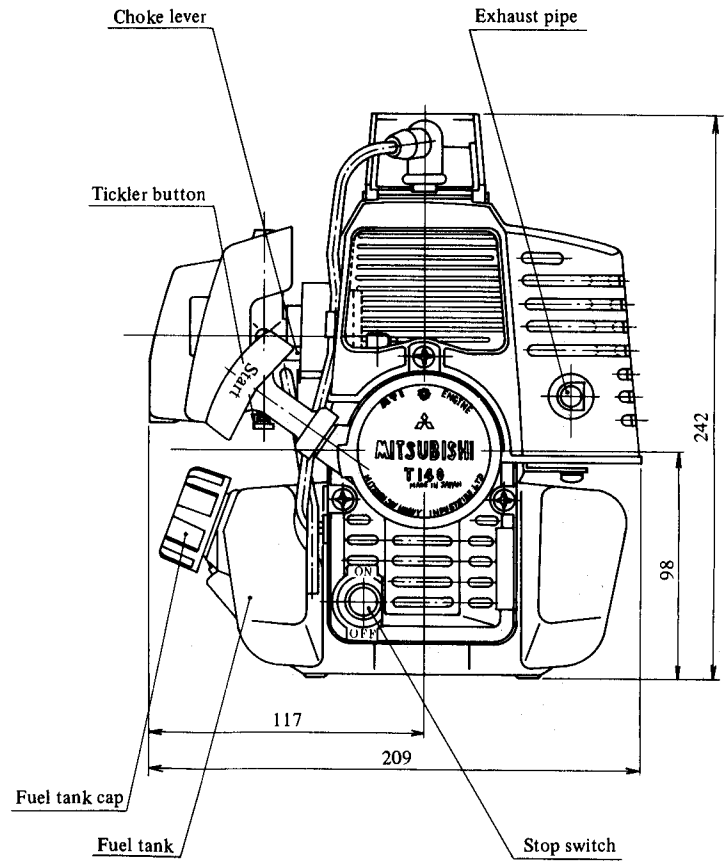
## 3. OUTLINE DRAWINGS OF T110P (FLANGE TYPE)



## OUTLINE DRAWINGS OF T140P (FLANGE TYPE)



## 4. STRUCTURE, FUNCTION AND SERVICING STANDARDS

### 4.1 Crankcase and fan case (clutch case)

The crankcase is made of aluminium by die casting. The compression ratio in the crankcase is 1.3 ~ 1.5 in general. Complete air tightness or seal should be provided for the crankcase, because the air-fuel mixture sucked through the intake port must be compressed before it is fed into the combustion chamber.

On the joint surfaces between the crankcase, fancase and clutch case, the knock pins are mounted to facilitate its assembly correctly when the engine is overhauled. The fancase and clutchcase are off-centered to send securely the cooling air to the cooling fins on the cylinder. Since the three cases (cases and rear case) are machined separately the spare parts of the cases can be shipped separately.

| | Driving side case | Starter side case |
|---|---|---|
| Ball bearing | 6001 | ← |
| Oil seal | TC, 12, 22, 7 | ← |
| Clutch case bearing ; | 6201Z | |
| Case tightening torque : | 0.4 ~ 0.5 kg·m | |

[Note] 1. The sealing type of bearing is indicated by Z in both single and both-sided seal.
2. One piece type clutch case is prepared for both T110PD and T140PD engines spare parts.

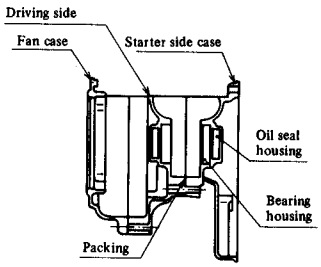



Fig. 1

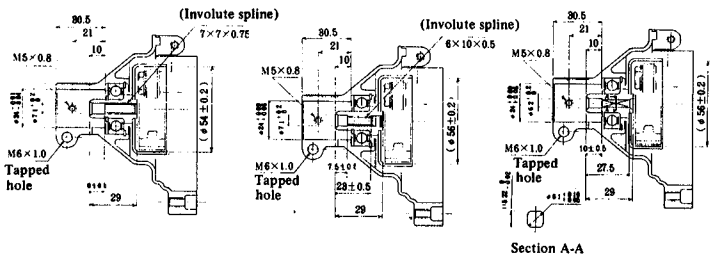



Fig. 2

### 4.2 Crankshaft and connecting rod

The crankshaft is a precision forging made of carburizing steel and is quenched and tempered normally. The crankpin and journal are case hardened and finished by grinding for wear resistance. The connecting rod and the crankshaft are assembled in pairs, and the needle bearings are fitted in the big and small end of the rod. Therefore, if either the crankshaft or the connecting rod requires replacement due to abnormality, the whole crankshaft assembly including connecting rod should be replaced.

However, as for the needle bearing at the small end, replacement of the needle bearing only is possible. Since high precision of each part is required to assemble the crankshaft and connecting rod, these parts are not replaceable separately.

(1) Runout of crankshaft end (Fig. 3, Fig. 4)

The runout of the crankshaft end (b, b') should be within the values shown in the table. The value is measured by a dial gauge by rotating the crankshaft supported the points (a, a') on the V-block.

The whole crankshaft assembly should be replaced if the allowable limit is exceeded.

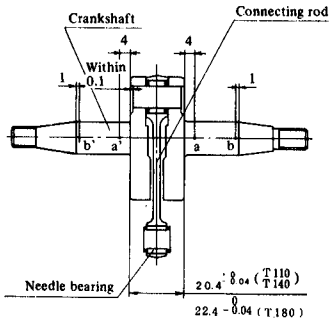



Fig. 3

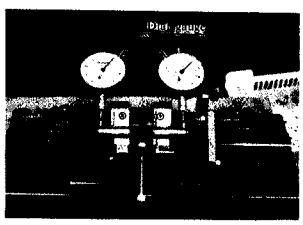



Fig. 4

(mm)

| | | |
|---|---|---|
| Standard dimension | b | Within 0.05 |
| | b' | Within 0.05 |
| Allowable limit | b | 0.06 |
| | b' | 0.06 |

(2) Clearance between crankshaft and connecting rod big end. (End play of big end) (Fig. 5)

Push the connecting rod in one direction and insert a feeler gauge into the clearance on the opposite side and measure the clearance at four places. Replace the whole crankshaft assembly if the clearance exceeds the allowable limit.

(mm)

| | |
|---|---|
| Standard clearance | 0.16~0.35L |
| Allowable limit | 0.55 |

Measuring equipment or apparatus
Filler or thickness gauge

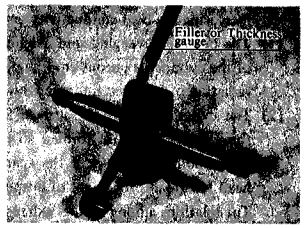



Fig. 5

(3) Clearance between connecting rod (big end) bearing and crankpin (Fig. 6)

After fixing the crankshaft, put a dial gauge on the connecting rod small end, and read the gauge value while moving the connecting rod in the longitudinal direction.

Replace the whole crankshaft assembly if the dial gauge reading exceeds the allowable limit.

(mm)

| Mode | T110P T140P | T180P |
|---|---|---|
| Standard clearance | 0.008~0.030L | 0.004~0.026L |
| Allowable limit | 0.05 | 0.05 |

Measuring equipment
Dial gauge or indicator

Fig. 6

(4) Clearance between crankshaft journal and main bearing (Fig. 7)

Measure the outside diameter of each crankshaft journal with a micrometer. Replace the crankshaft assembly and main ball bearings if the clearance exceeds the allowable limit.

(mm)

| | |
|---|---|
| Crankshaft journal dimension | $\phi 12\ ^{-0.05}_{-0.10}$ |
| Standard clearance | 0.006T~0.017L |
| Allowable limit | 0.05 |

Measuring equipment
Micrometer

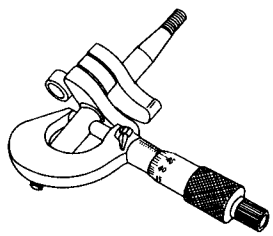


Fig. 7

### 4.3 Cylinder

The cylinder and cylinder head are made of aluminium die casting and cast in one piece for increasing the heat conductivity and reducing the engine weight.

(1) The intake, scavenging, and exhaust ports are prepared on the cylinder and the inner surface of the cylinder is porous-chrome plated (channeled type) to increase the wear-resistance. The radiation of heat was improved due to the lengthened cylinder.

(2) The cylinder head inner surface forms a part of spherical surface and the cooling fins on the outer surface are formed so that air may flow sufficiently between them to provide a large cooling effect. And the spark plug is mounted on the right overhead of the cylinder head for the improvement of output.

The relations among intake, exhaust and scavenging are shown in Fig. 8 and Fig. 9.

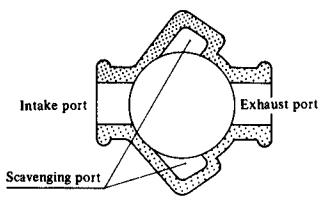



Fig. 8

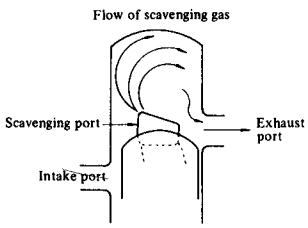



Fig. 9

(3) The carburetor mounting surface on the cylinder is provided with an air hole (pulse hole) for transmitting the pressure variations in the crankcase to the diaphragm pump in the carburetor through the insulator.

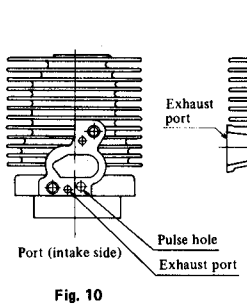



Fig. 10

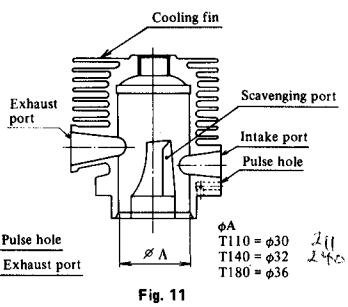



Fig. 11

(4) Cylinder bore

(mm)

| Item \ Model | T110P | T140P | T180P |
|---|---|---|---|
| Standard dimension | $\phi30\ ^{+0.02}_{0}$ | $\phi32\ ^{+0.02}_{0}$ | $\phi36\ ^{+0.02}_{0}$ |
| Allowable limit | Until plating exfoliates | ← | ← |

## 4.4 Piston and piston rings

The special light alminium alloy piston which reduces its weight and mass of reciprocating motion can lessen the bearing loads during the operation of the engine. In a two-cycle engine, the piston, with its original function, also plays an important role in the function of valves actuating at the suction, scavenging and exhaust strokes of the engine.

Therefore, a hemispherical shape is adopted for the piston crown to facilitate the flow of the exhaust gas and scavenging air.

The piston rings are positioned with knock pins so that their open ends will not be caught by the ports in cylinder.

The slip-out of the pin from the piston is protected by the stop rings or snap rings which installled both sides of the piston pin hole.

The piston rings are made of special cast iron and their surface are treated with parkerizing for improving wear resistance.

The O-mark or ↑-mark is stamped on the top of the piston. These marks indicate the direction of the piston insertion into the cylinder. Insert the piston into the cylinder aligning the convex portion of the piston with intake port side without fail.

If the piston is reversely inserted by mistake, it will cause the rings to stick.

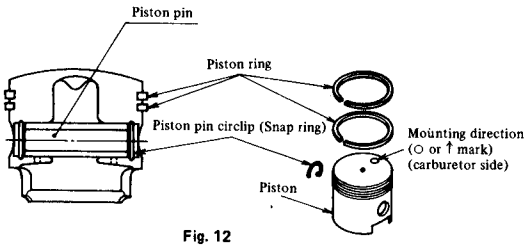



Fig. 12

(1) Clearance between piston and cylinder (Piston clearance) (Fig. 13)

(mm)

| Mode \ Model | T110P | T140P | T180P |
|---|---|---|---|
| Piston outside diameter | $\phi30\ ^{-0.025}_{-0.040}$ | $\phi32\ ^{-0.025}_{-0.040}$ | $\phi36\ ^{-0.025}_{-0.040}$ |
| Standard dimension | 0.025~0.06 | ← | 0.035~0.07 |
| Allowable limit | 0.10 | ← | ← |

Measure the maximum diameter of the piston with a micrometer and calculate the difference (called piston clearance) between it and the maximum cylinder bore. Replace the piston assembly if this clearance exceeds the allowable limit.

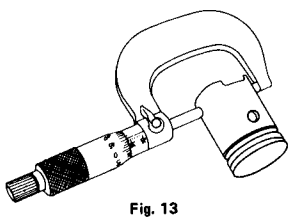


Fig. 13

(2) Clearance between piston (pin) hole and piston pin (Fig. 14, Fig. 15)

Measure the piston pin hole inside diameter with a cylinder gauge and measure the piston pin outside diameter with a micrometer. Replace the piston and piston pin in a set if the fitting clearance exceeds the allowable limit.

(mm)

| Model | T110P | T140P | T180P |
|---|---|---|---|
| Standard dimension | 0.006T ~0.010L | ← | ← |
| Allowable limit | 0.06 | ← | ← |

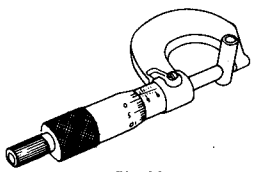


Fig. 14

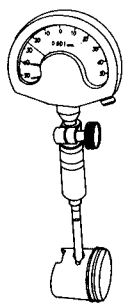


Fig. 15

(3) Clearance of open ends of piston ring (Ring gap) (Fig. 16)

Insert the piston ring into the cylinder skirt horizontally (so that the ring will be square with cylinder wall by using the piston. See Fig. 16) and measure the gap (dimension A as shown in Fig. 16) with a feeler gauge.

Replace piston rings if this gap exceeds the allowable limit.

(mm)

| Model | T110P | T140P | T180P |
|---|---|---|---|
| Standard dimension | 0.1~0.3 | ← | ← |
| Allowable limit | 0.7 | ← | ← |

Measuring apparatus, Feeler gauge

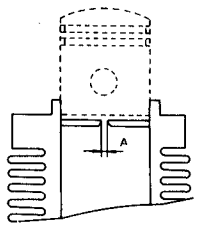



Fig. 16

(4) Clearance between piston ring and ring groove (Piston ring side clearance) (Fig. 17)

Measure the clearances between piston rings and ring grooves with a feeler gauge. Replace the piston and piston rings if clearance exceeds the allowable limit.

(mm)

| Model | T110P | T140P | T180P |
|---|---|---|---|
| Standard dimension | 0.02~0.06 | ← | 0.04~0.08 |
| Allowable limit | 0.15 | ← | ← |

Measuring apparatus, feeler gauge

Fig. 17

## 4.5 Centrifugal clutch (Fig. 18, 19)

The centrifugal clutch is equipped with two weights (shoes) and one spring. When the engine revolution reaches the specified level, it causes the weights to fly outward by centrifugal force, make the shoes come closely into contact with the drum on the clutch case and thus transmits the power to the working machine (powered equipment).

The centrifugal clutch is directly mounted on the boss of the flywheel.

(1) Clutch drum diameter, clutch-IN and clutch-OFF revolution.

Clutch-IN revolution means the engine speed at which the clutch begins to transmit the rotation to the driven side in the state where a load of 0.01 kg·m is applied. The clutch-OFF revolution means the engine speed at which the driven shaft is stopped on the same conditions.

| Model | T110P, T140P | T180P |
|---|---|---|
| Clutch drum inside diameter (mm) | $\phi54$ or $\phi56$ | $\phi76$ or $\phi78$ |
| Clutch IN standard revolution (rpm) | 3600~4200 | 3200~3800 |

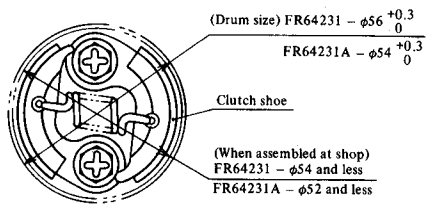

(Drum size) FR64231 – $\phi56\ ^{+0.3}_{0}$
FR64231A – $\phi54\ ^{+0.3}_{0}$
Clutch shoe
(When assembled at shop)
FR64231 – $\phi54$ and less
FR64231A – $\phi52$ and less

Fig. 18

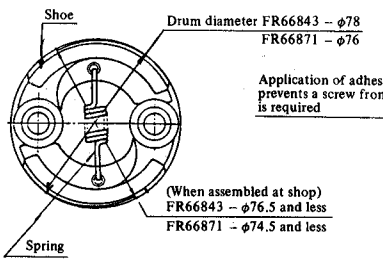
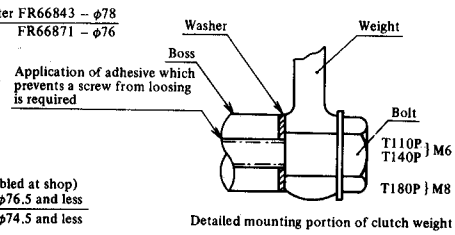



Fig. 19




Detailed mounting portion of clutch weight

Fig. 20

Note: Be careful not to apply adhesive on the sliding parts of clutch weight mounting bolts and washers.

(2) The "P" and "M" marks which indicate the direction of rotation and installation are shown on the clutch. Be careful of these marks when installing the clutch.

(3) Do not operate the clutch under an overload for a long time, otherwise the clutch will slip and peeling of shoes will occur due to the heat generated by friction.

| Weight tightening torque | 0.6 to 0.8 kg·m |
|---|---|

## 4.6 Recoil starter

The recoil starter is mounted as a standard on the engine for increasing efficiency and safety of the operation. When the starter rope which is wound on the reel by the spring tension is pulled by hand, the fly wheel will rotate to start the engine resulting from meshing of the ratchet gear linked to the flywheel with the reel's rack. After starting the engine, the ratchet opens freely by centrifugal force.

(1) When the binding screw tightened, apply the adhesive on it which prevents it from loosing. (Thightening torque = 35 kg·cm)

(2) Apply high quality grease a little on the hook portion of the reel.

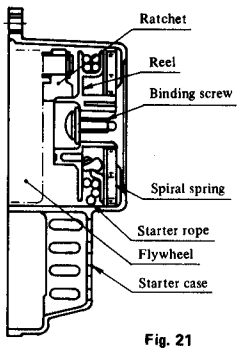



Fig. 21

## 4.7 Throttle wire

The throttle wire is the remote controller for controlling the engine revolution. Its adjuster is of turnbuckle type to facilitates the adjustment. (Fig. 22)

Notes:

When the play of the throttle wire is too large, the throttle valve opening (about 40% at the time of starting) of the carburetor is changed and it will adversely affect the starting performance. Adjust the play within the standard value with adjusting nut.

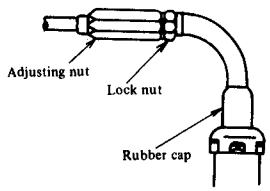



Fig. 22

| Standard play of the throttle wire | 0.5 to 1.0 mm |
|---|---|

○ Adjusting procedure.

Adjust the play of the throttle wire by using the dajusting nut to the value of 0.5~1.0 mm while moving the armored cable and set with the lock nut firmly.

## 4.8 Fuel system

The fuel system is composed of the following parts, and all of these parts have been made to satisfy the intended functions.

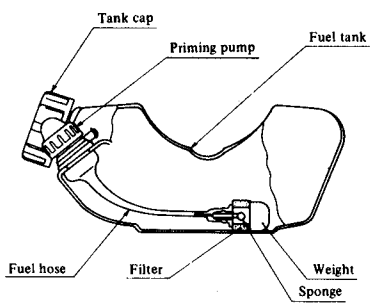



Fig. 23

(1) Fuel tank

Taking into account light weight, gasoline-resisting and heat resistance, the fuel tank is made of the plastic resin.

| Model | T110P | T140P | T180P |
|---|---|---|---|
| Tank capacity | 0.5ℓ | 0.6ℓ | 0.9ℓ |

(2) Tank cap

The tank cap is made to satisfy such functions that, the good ventilation, no abnormal increasing of the inner pressure due to the temperature rise and minimal leakage of fuel. An umbrella valve is adopted for the tank cap of the engine with diaphragm type carburetor, therefore the above mentioned functions are satisfied.

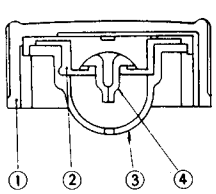



Fig. 24

| Symbol | Name |
|---|---|
| 1 | Cap |
| 2 | Valve holder |
| 3 | Packing |
| 4 | Valve (umbrella valve) |

Figure shows the flow of air in the umbrella valve.

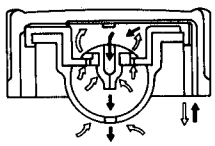



Fig. 25

Handling of cap with umbrella valve

In summer, when brush cutter engine is stopped temporarily at a break etc. during operation, place the engine in the position shown in right figure (26) so that the hole of the inner packing of the fuel cap is not dipped in the fuel, otherwise the fuel may leak from the cap due to the increasing of the inner pressure of the tank.

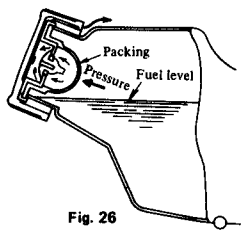



Fig. 26

(3) Priming pump (Primer)

The priming pump is used for feeding fuel to the carburetor at the time of starting of the engine, and it is of manual operation. Because the inner parts are very small in size, care should be exercised not to miss them and not to make a misassembly at the occasions of disassembly and reassembly.

Priming pump inner parts

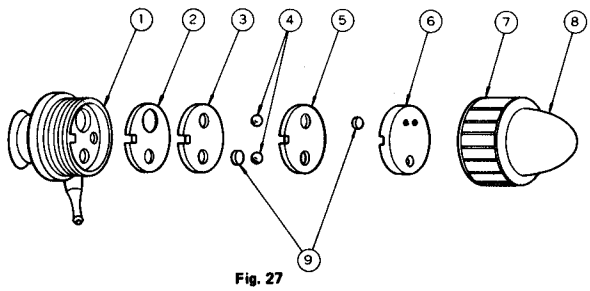



Fig. 27

| Symobl | Part Name | Part No. | Amount | Remarks | Symbol | Part Name | Part No. | Amount | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Pump body | – | 1 | | 6 | Valve seat B | FR64284 | 1 | |
| 2 | Packing B | FR64285 | 1 | t0.6 | 7 | Pump cap | FR64248 | 1 | |
| 3 | Valve seat A | FR64244 | 1 | | 8 | Rubber cap | FR64247 | 1 | |
| 4 | Valve | FR64246 | 2 | Ball | 9 | Valve cushion | FR64281 | 2 | Sponge |
| 5 | Packing A | FR64245 | 1 | t1.2 | | | | | |

Assembling order

1. Insert packing B into the pump body.
2. Insert valve seat A, with the seating side facing upward.
3. Mount one valve cushion on the pipe joint side.
4. Insert packing A.
5. Mount two balls.
6. Mount valve cushion in valve seat B . . . on the side of two holes.
7. Insert valve seat B.
8. Tighten the cap by hand securely.

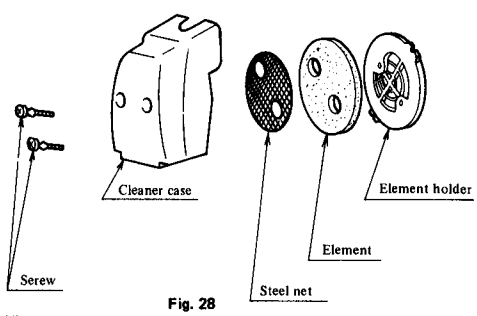



Fig. 28

## 4.9 Air cleaner

The air cleaner is equipped with polyurethane foam element having high filtering efficiency, and the mufler mounted on the cleaner case reduces noise of air inlet.

The output of the engine drops when the air cleaner element is clogged and the starting performance drops as well. Therefore, clean it once every 25 hours or less of the operation

## 4.10 List of servicing standards

240

(mm)

| Servicing item | T110P | | T140P | | T180P | |
|---|---|---|---|---|---|---|
| | Standard dimension | Allowable limit | Standard dimension | Allowable limit | Standard dimension | Allowable limit |
| Cylinder bore dimension | $\phi 30\ ^{+0.02}_{0}$ | Until plating exfoliates (peel off) | $\phi 32\ ^{+0.02}_{0}$ | Until plating exfoliates (peel off) | $\phi 36\ ^{+0.02}_{0}$ | Until plating exfoliates (peel off) |
| Clearance between piston and cylinder (difference between maximum cylinder bore and piston outside diameter) | 0.025~ 0.06 | 0.10 | 0.025~ 0.06 | 0.10 | 0.035~ 0.07 | 0.10 |
| Clearance between piston (pin) hole and piston pin | 0.006T~ 0.010L | 0.05 | 0.006T~ 0.010L | 0.05 | 0.006T~ 0.010L | 0.05 |
| Clearance between open ends of piston rings (Ring gap) | 0.1~0.3 | 0.7 | 0.1~0.3 | 0.7 | 0.1~0.3 | 0.7 |
| Clearance between piston ring and ring groove (Ring side clearance) | 0.02~ 0.06 | 0.15 | 0.02~ 0.06 | 0.15 | 0.04~ 0.08 | 0.15 |
| Clearance between rod big end and crankpin | 0.008~ 0.030L | 0.05 | 0.008~ 0.030L | 0.05 | 0.004~ 0.026L | 0.05 |
| Clearance between rod small end and piston pin | 0.003L~ 0.025L | 0.05 | 0.003L~ 0.025L | 0.05 | 0.003L~ 0.023L | 0.05 |
| Axial or end play of crankshaft | 0.02~ 0.30 | 0.5 | 0.02~ 0.30 | 0.5 | 0.02~ 0.30 | 0.5 |
| Clearance between crankshaft and main bearing | 0.006T~ 0.017L | 0.05 | 0.006T~ 0.017L | 0.05 | 0.006T~ 0.017L | 0.05 |
| Clearance between crankshaft and connecting rod big end (End play of big end) | 0.16~ 0.35L | 0.55 | 0.16~ 0.35L | 0.55 | 0.16~ 0.35L | 0.55 |
| Runout of end of crankshaft | 0.05 | 0.06 | 0.05 | 0.06 | 0.05 | 0.06 |
| Spark plug electrode gap | $0.7\ ^{0}_{-0.1}$ | 0.8 | $0.7\ ^{0}_{-0.1}$ | 0.8 | $0.7\ ^{0}_{-0.1}$ | 0.8 |

Note: Replace parts when the dimension exceeds the allowable limit, except for spark plug gap which might be adjustable.

# 5. STRUCTURE OF CARBURETOR AND INSPECTION AND ADJUSTING PROCEDURES

## 5.1 Description of components

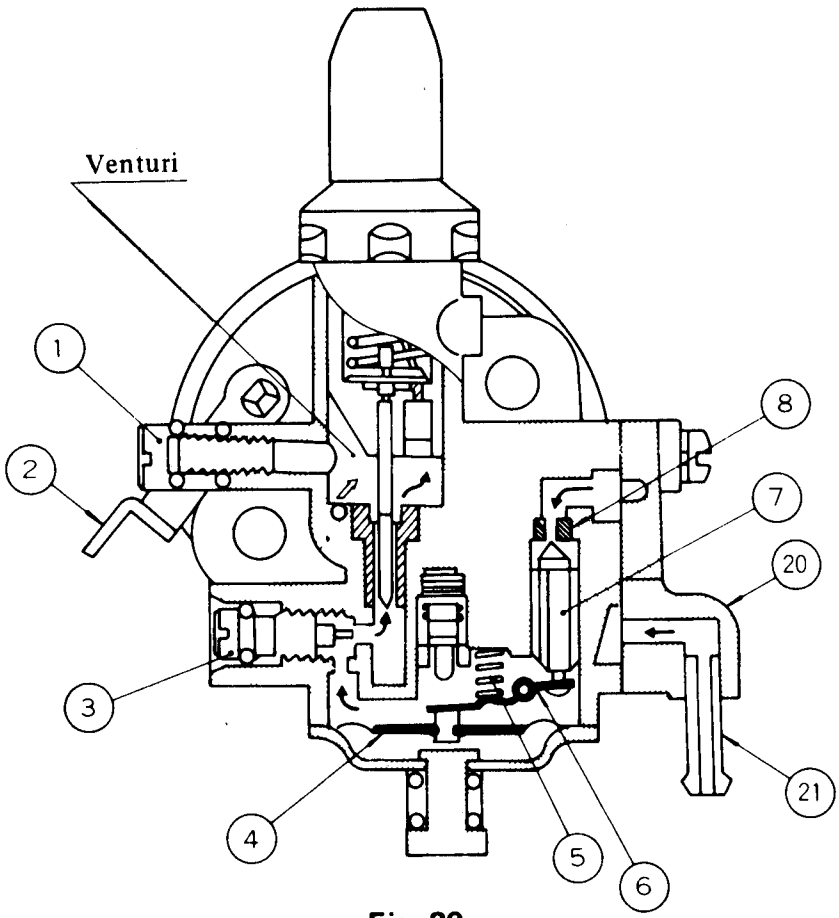



Fig. 29

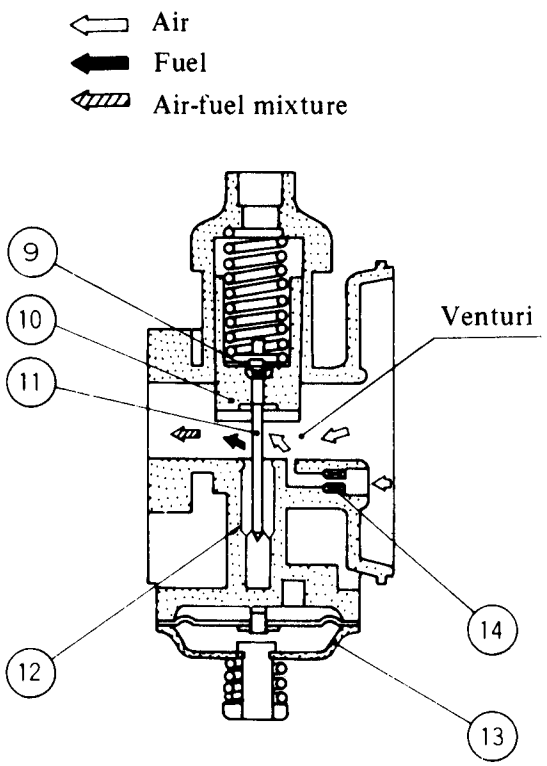



Fig. 30

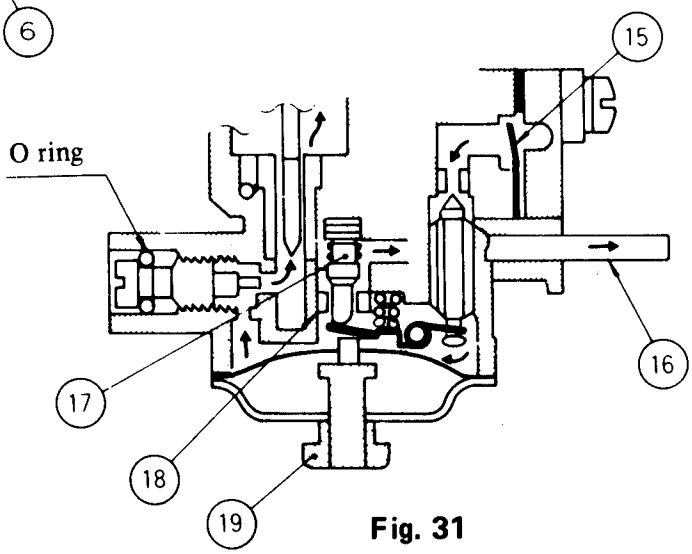



Fig. 31

| Symbol | Part Name | Symbol | Part Name | Symbol | Part Name |
|---|---|---|---|---|---|
| 1 | Throttle adjusting screw | 8 | Valve seat | 15 | Pump diaphragm |
| 2 | Choke lever | 9 | Clip | 16 | Overflow pipe |
| 3 | Main adjusting screw | 10 | Throttle valve | 17 | Overflow valve |
| 4 | Main diaphragm | 11 | Jet needle | 18 | Overflow valve seat |
| 5 | Inlet valve spring | 12 | Needle jet | 19 | Tickler button |
| 6 | Float arm | 13 | Main diaphragm cover | 20 | Pump cover |
| 7 | Float valve | 14 | Slow air jet | 21 | Joint |

## 5.2 Operation of carburetor

The operating principle of the carburetor is an application of the Venturi effect.
The primary functions of a carburetor are to mix the liquid (fuel) with gas (air) where both of them are different essentially in their properties, in the proper proportions, and to supply the fuel-air mixture to the engine in accordance with the operating conditions.

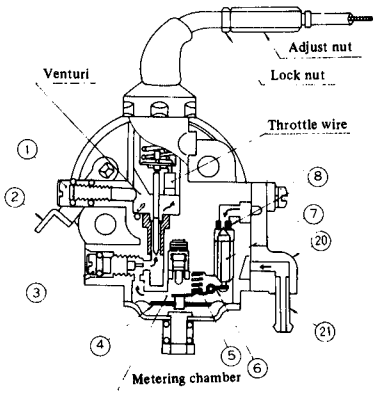


Fig. 32

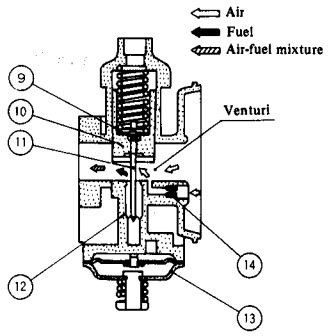


Fig. 33

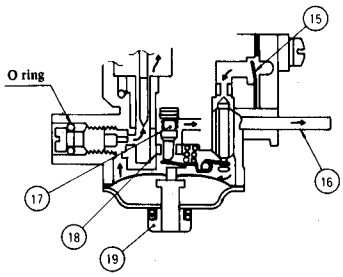


Fig. 34

(1) Pump diaphragm (15) is caused to operate by the variations of the pressure in the crankcase of the engine, fuel is sucked through fuel pipe joint (21) and this fuel is fed under pressure to float valve (7).

(2) The engine intake pressure is applied to main diaphragm (4) by needle jet (12), and the atmospheric pressure pushes the opposite side of the main diaphragm. Float arm (6) is pushed as a result and float valve (7) is lowered. Therefore, the fuel makes inflow into the float chamber.

(3) The fuel in metering chamber is sucked by the negative pressure in the venturi, and jets out through needle jet (12) and is sucked into the engine in the form of air-fuel mixture.

(4) When the engine stops, the negative pressure in the venturi is released, float arm (6) is pushed upward by inlet valve spring (5), and float valve (7) closes. Inflow of fuel is stopped, as a result, and this prevents the overflow of the fuel.

☆ When tickler button (19) is pushed and primed with the priming pump, the fuel for starting the engine, is fed by pressure to the metering chamber through diaphragm pump (13) and float valve (7), and mixed with the air of the metering chamber and is discharged from overflow pipe (16)

## 5.3 Characteristics of main parts and adjusting procedures

### 5.3.1 Throttle valve and jet needle

(1) Characteristics

The throttle valve is of piston type, and it provides good response to the engine speed from low speed to high speed. As the bottom profile of the throttle valve is such that the air inflow-sectional area is larger than the air outflow-sectional area so the velocity of flow of air-fuel mixture is increases. Therefore when the valve opening is small, the atomization of fuel is made satisfactorily.

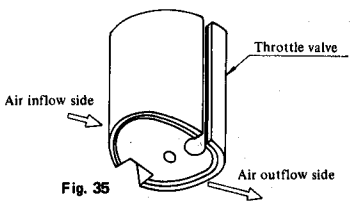


Fig. 35

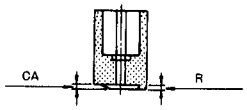


Fig. 36

o Various cut aways (CA) and recesses (R) of the throttle valves have been adopted to meet each model for stabilizing the fuel flow rate during idling revolution.

(mm)

| | T110P | T140P | T180P |
|---|---|---|---|
| CA | 0.7 | ← | 0.5 |
| R | $0.5^{0}_{-0.1}$ | ← | ← |

o The air-fuel mixture supply rate to the combustion chamber is controlled by changing the opening of the throttle valve. That is, suction airflow is controlled by it and at the same time, the fuel flow rate injected out of the needle jet is metered by the jet needle which moves in the needle jet in accord with the opening of the throttle valve. Fig. 37 indicates the states of needle jet, throttle valve and air-fuel mixture.

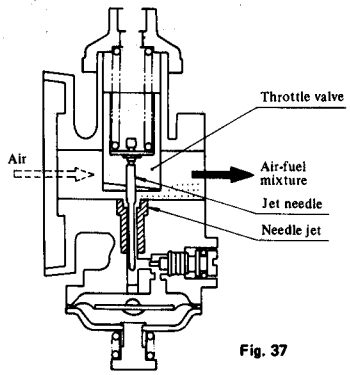


Fig. 37

(2) Adjustment

(1) Throttle valve and throttle adjusting screw

Adjust the throttle valve opening during idling revolution with the throttle adjusting screw (stop screw).

Engine revolution increases when the screw turned clockwise.

Engine revolution decreases when the screw turned counterclockwise.

Note: The engine may stall if the revolution is excessively decreased.

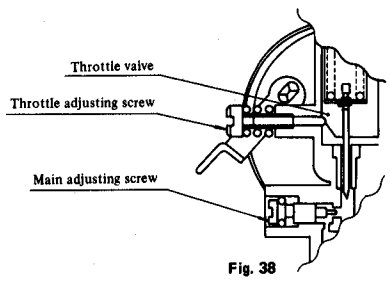


Fig. 38

| Standard idle speed |
|---|
| 2300 to 2700 rpm |

(2) Jet needle

The head of the jet needle is provided with three grooves and the setting is made usually at the center groove. Readjustment is not usually required because matching is made with the engine so that the optimum air-fuel mixture is obtained at this position.

When the clip is set in an upper groove . . . . . .The clearance between the jet needle and needle jet becomes small and the air-fuel mixture becomes lean.

When the clip is set in a lower groove . . . . . .The clearance between jet needle and needle jet becomes large and the air-fuel mixture becomes rich.

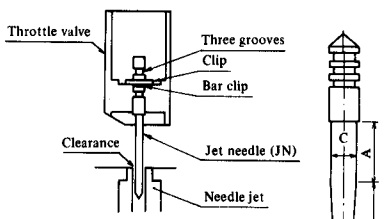


Fig. 39

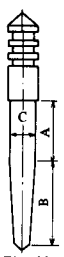


Fig. 40

C : Diameter of straight portion
A : Straight portion (functions at show speed)
B : Tapered portion (functions at mediam speed)

JN size (mm)

| Model | T110P | T140P | T180P |
|---|---|---|---|
| Straight | φ2.020 | φ2.025 | φ2.010 |
| Taper | 11.5X1° | 12X1° | 11X1°15′ |

### 5.3.2 Main adjusting screw

(1) Characteristics

The main adjusting screw is used for controlling the fuel flow rate to meet the optimum quantity required for the engine.

(2) Adjustment

Adjust the engine with the main adjusting screw so that the highest output is developed when a large load is applied at a high speed.

| Standard back-off turns: 2 1/2 ± 1/2 turns |
|---|

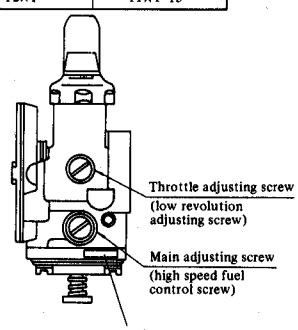


Fig. 41

(1) Move the throttle lever to the full open position.

(2) Set the main adjusting screw in the position where the revolution is most stabilized, by turning it clockwise and counterclockwise within the range of the standard back-off turns (2 1/2 ± 1/2 turns).

The air-fuel mixture becomes lean when the screw is turned clockwise.

The air-fuel mixture becomes rich when the screw is turned counterclockwise.

(3) Check of rapid acceleration and deceleration.

Quickly move the throttle lever to the open position and close position, and check if acceleration and deceleration are made smoothly.

☆ If the engine stalls or acceleration is unsatisfactory, it is assumed that the air-fuel mixture is too lean. Make adjustment once again with the main adjusting screw.

### 5.3.3 Main diaphragm

(1) Characteristics

In the diaphragm, the differential pressure between the engine intake pressure and the atmospheric pressure is converted into the force of a vertical motion, by the application of this force, operation of the float valve is controlled by the float arm, and also the fuel flow rate entering the metering is controlled. This function is equivalent to that of the float in a float type carburetor, and what is equivalent to the oil level in a float type carburetor is the internal pressure of the metering chamber.

(2) Adjustment (servicing procedure)

The diaphragm should be free from damage and the receive pan should be free from deformation And be careful of the knock pin hole at mounting of the carburetor to the carburetor body. In addition, pay particular attention of the handling of the diaphragm, because it is an important part.

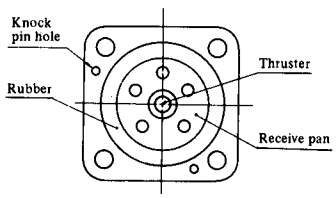



Fig. 42

### 5.3.4 Float valve (needle valve)

(1) Characteristics

In accordance with the vertical motion of the main diaphragm, the float arm operates to flow the fuel from the float valve into the float chamber. The fuel flow rate is controlled by the float valve which is linked together with the float arm.

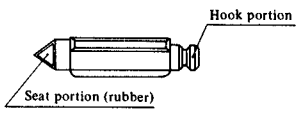



Fig. 43

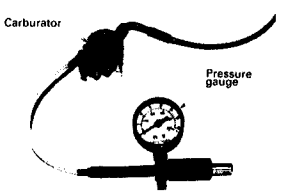
(2) Adjustment (servicing procedure)

The float valve should operate smoothly and should be airtight when the valve is fully closed. If the seat of the float valve is damaged by foreign matters or the stepped wear occurs due to a long period of use, can cause overflow and the engine goes malfunction. Replace the float valve with a new one in such a case.

☆ Assembling and adjusting procedures at the replacement of float valve

1. Servicing standard

| | | |
|---|---|---|
| 1 | Float arm height (from the body surface) (mm) | 1.4 to 1.6 |
| 2 | Free length of inlet valve spring (mm) | 8 |
| 3 | Valve opening pressure (kg/cm²) | 0.9 ± 0.2 |
| 4 | Valve closing pressure (kg/cm²) | 0.5 and over |




Pressure gauge to mesure the valve opening and closing pressures

Fig. 44

2. Precautions for disassembly & reassembly.

(1) On installation of the inlet valve spring, the mounting load (the force that holds the float valve at the time of mounting) is important. Therefore, the free length should not be changed by extending the spring. Also be careful of the inclination of the spring at the time of mounting.

Check if the spring is securely seated on the guide (protruded part) of the float arm.

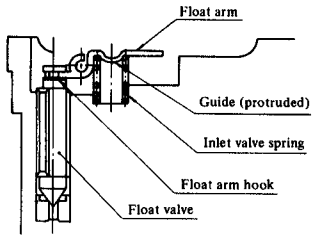



Fig. 45

(2) Check if the hook at the end of the float arm is correctly fitted on the float valve.

(3) Fully bring the float pin to the float pin set screw side at the time of tightening of the float pin. If the float pin is tightened in the state where it is located on the side of the * mark in the right figure, the pin will be lifted up, the specified float lever height will not be obtained and the vlave opening pressure (0.9 ± 0.2 kg/cm²) will also be disordered. Therefore, particular care should be exercised in the setting of the float pin.

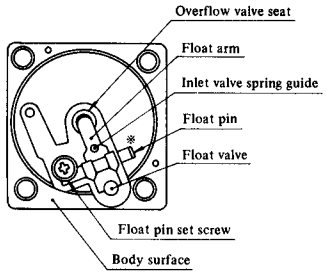



Fig. 46

(4) The float arm height is a very important factor for the engine performance.

Correctly adjust its height using a height gauge. Adjust it within 1.4 to 1.6 mm from the carburetor body surface as shown in the figures.

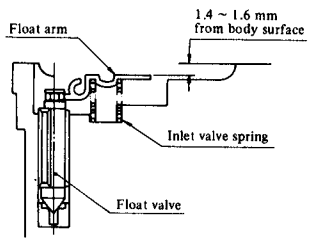



Fig. 47

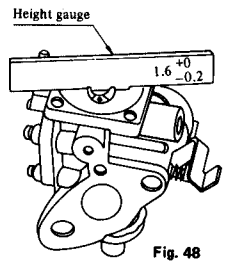



Fig. 48

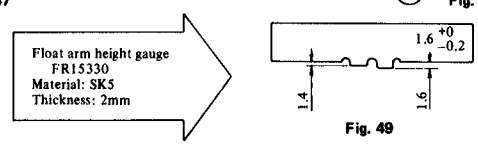



Fig. 49

○ Fuel flow rate becomes excessive when the float lever height is too high.

○ Fuel flow rate becomes insufficient when the float lever height is too low. (Shortage of output power and faulty acceleration will result.)

### 5.3.5 Diaphragm pump

(1) Characteristics

The diaphragm pump is used for feeding the fuel under pressure to the float valve. If the function of this part drops, troubles such as failure in starting, faulty acceleration and engine stall will occur.

What perform the pumping action by variation of pressure in the crankcase are check valves.

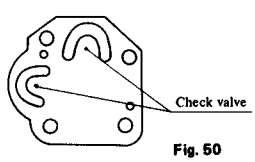



Fig. 50

(2) Adjustment (servicing procedure)

The portion of check valves of the pump diaphragm should be flat without damage and deformation. Therefore, mounting should be correctly made at assembly with the correct direction of the diaphragm and correct assembly order of the gaskets.

### 5.3.6 Carburetor troubleshooting

| Trouble phenomenon | | Probable cause | Remedy |
|---|---|---|---|
| Staring failure | Fuel is not sucked into the cylinder. | Imperfact closing of choke valve. | Fully close choke valve. |
| | | Faulty operation of float valve. | Disassemble and clean. |
| | | Clogged fuel passage with dust or gummy matter produced by deterioration of gasoline. | Disassemble and clean. |
| | | Excessively tightened main adjust screw. | Adjust. |
| | | Low float arm height. | Adjust. |
| | | Faulty assembly of inlet valve spring. | Carry out assembly once again. |
| | | Faulty assembly of float arm pin. | Carry out assembly once again. |
| | Fuel is sucked excessively. | Dust or dart in float valve seat. | Disassemble and clean. |
| | | Clogged air cleaner. | Disassemble and clean. |
| | | Faulty adjustment of main adjusting screw. | Adjust. |
| | | Excessive float arm height. | Adjust. |
| | | Faulty setting of jet needle groove. | Carry out assembly once again. |
| | | Faulty assembly of inlet (valve spring). | Carry out assembly once again. |
| Idling is unstable. | | Come off of rubber cap. | Fix securely. |
| | | Dirty float valve. | Diassemble and clean. |
| | | Faulty adjustment of adjusting screw (idle speed too low) | Adjust. |
| | | Faulty adjustment of float arm. | Carryout assembly once again. |
| | | Faulty positioning of jet needle. | Carry out assembly once again. |
| | | Faulty assembly of flat arm pin. | Carry out assembly once again. |
| | | Faulty assembly of inlet valve spring. | Carry out assembly once again. |
| Disorder at high speed | ○ Revolution cannot be increased (engine stalls)<br>○ Revolution is unstable even when it can be increased. | Insufficient of opening of choke valve. | Open choke valve fully. |
| | | Worn float valve | Replace parts. |
| | | Clogged main adjusting screw system. | Disassemble and clean. |
| | | Faulty assembly of main adjusting screw. | Adjust. |
| | | Faulty assembly of float arm pin. | Assembly |
| | | Faulty height of float arm. | Adjust. |
| | | Faulty mounting of inlet valve spring. (diaphragm piston) | Carry out assembly once again. |
| | | Deteriorated diaphragm. | Replace parts. |
| | | Excessive play of throttle wire. | Carry out assembly once again. Adjust. |
| Disorder at high speed | Engine stall or disorder in revolution occurs during the work, but order is good only for a short period of time when the engine is restarted. | Clogged fuel suction hose or fuel filter. | Disassemble and clean or replace. |
| | | Faulty ventilation of fuel tank cap. | Clean. |
| | | Clogged pulse hole or faulty assembly of packing. (opposite direction) | Disassemble and clean. |
| | Air-fuel mixture is too rich at high speed even when main adjust screw is crew in. | Worn main adjust screw. | Replace parts. |
| Faulty acceleration | | Overtightened main adjusting screw. | Adjust screw |
| | | Faulty height of float arm. (too low) | Adjust. |
| | | Loose diaphragm cap. | Retighten. |
| | | Leakage from diaphragm packing. | Retighten or replace packing. |
| | | Clogged needle jet. | Clean. |
| | | Low idling revolution. | Adjust. |
| Overflow occurs. | | Faulty assembly of float arm and inlet valve spring. | Carry out assembly once again. |
| | | Worn float valve. | Replace parts. |
| | | Faulty operation of float valve. | Clean. |
| | | Dart in float valve seat. | Clean. |
| | | Faulty assembly of diaphragm. | Carry out assembly once again. |
| | | Improper float arm height. (too high) | Adjust. |

## 6. STRUCTURE OF FLYWHEEL MAGNETO AND INSPECTION AND ADJUSTING PROCEDURES

The flywheel magneto is composed of the flywheel and the ignition unit which incorporates the ignition coil. MTI (Mitsubishi Transister Ignitor) unit which breaks the primary current intermittently is used for this engine.
The inspection and maintenance for each part are as follows.

### 6.1 Flywheel

(1) Magnetic steel for generating current is caset on the flywheel.
And the flywheel has many parts and various functions, such as ratchet for recoil starter, tapped hole (M6) for puller etc. extremely care should be exercised not to drop it onto the ground in assembling and reassembling.

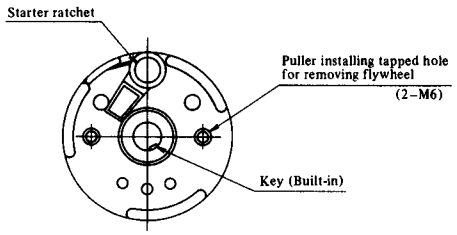



Fig. 51

(2) Notice for servicing flywheel
(1) When mounting the flywheel onto the crankshaft, clean (do not use woolen waste cloth) the foreign matters on the taper part, and align the buil-in key on the flywheel with the key seat on the crankshaft correctly, and then install it securely.
(2) The standard tightening torque for flywheel nut : 0.8 to 1.0 kg·m
Use torque wrench without fail.

### 6.2 Ignition coil

(1) The ignition coil is water-resistant completely, because the coil is impregnated with epoxy resin and outside case in molded of phenol resin.
The primary (winding) coil (low votage) and secondary (winding) coil (high voltage) are installed inside of the coil case.

And the primary coil is connected to the MTI unit and stop switch, and the secondary coil to the spark plug respectively.

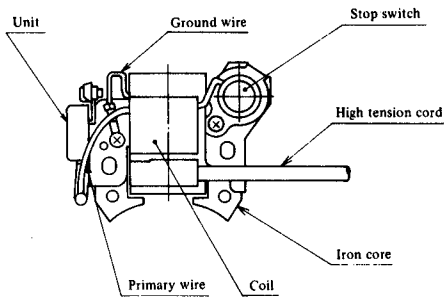



Fig. 52

(2) To check the ignition coil : Check the contact condition between MTI unit mounted on iron core of the coil and terminal points of the primary wire and also of the stop switch. For the interior inspection, check to see if the sparking performance satisfies the standards with a coil tester, and replace it if the performance is not exceeds the standard. Take care that even when the tester indicates normality of the ignition coils, if the phenol resin case had been cracked, the current might cause a leak through the crank case.

Three needle sparking performance (at normal temperature).

| 6.0 mm / 600 rpm |
|---|

.1362

### 6.3 Adjustment of ignition coil air gap

The clearance (air gap) between the ignition coil and the circumference of the flywheel affects the starting performance greatly. Therefore adjust the air gap carefully.

Adjusting procedure: .0182/.0157

☆ Air gap: 0.3 mm to 0.4 mm
Insert 0.3 mm-thick paper between the flywheel and the iron core of the ignition coil, and depress the ignition coil onto the flywheel and then tighten the mounting screw for the igntion coil firmly.

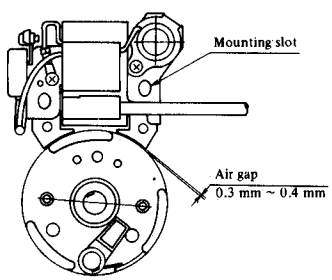



Fig. 53

(Becareful of the gap, if it is less than 0.3 mm, there is a danger of interference between the iron core and the flywheel)

### 6.4 MTI unit

MTI (Mitsubishi Transistor Ignitor) is a contactless or breakerless ignition unit its function relys on the electronic control. As the ignition timing is controlled by means of electronic circuit, MTI unit is free from foulness or wear of the contact points and troubles due to the rust which are found in a conventional contact breaker, and moreover the more stable sparking performance is obtained for long time.

#### 6.3.1 Function of semiconductor

Before the principle of MTI system is explained, the functions of semiconductor elements used for MTI magneto is explained briefly in the following table.

(1) N-type semiconductor
When arsentic or antimony element which belongs to V group is added infinitesimally small quantity to the pure crystal of silicon or germanium, the created semiconductor is the N-type.

(2) P-type semiconductor
When gallium or indium element which belongs to III group is added infinitesimally small quantity to the pure crystal of silicon or germanium, the created semiconductor is the P-type.

| Name | Symbol | Function |
|---|---|---|
| Diode | A (Anode) ⊕ ⊖ K (Cathode) | Diode behaves like a so-called "rectifier". Current flows in the direction from A to K, however, it does not flow in the direction from K to A. |
| Transistor | C (Collector) B (Base) $I_C$ $I_B$ E (Emitter) | When the voltage is applied between B and E to flow IB, the large current IC which is in proportion to IB flows from C to E. A transistor functions as an amplifier to control the large current IC by very small current IB. |
| Thyristor | A (Anode) G (Gate) $I_A$ $I_G$ K (Cathode) | Thyrister behaves like a called "electronic switch". Generally the current does not flow from A to K because of high resistance (OFF condition). However, when the specific gate current flows from G to K, the internal resistance between A and K becomes lower and the current flows (ON condition) from A to K. |

(2) Operational principle

MTI (U type TCI) basic circuit diagram

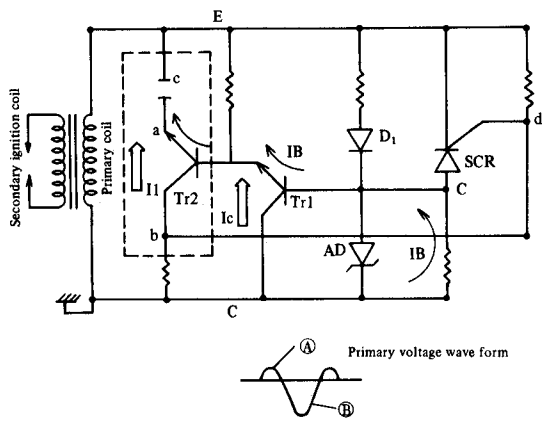



Fig. 54

(1) An AC electromotive force is induced in the primary coil of the ignition coil by the rotation of the flywheel, that is alternating voltage is generated between E and C points. This primary voltage (Refer to wave form A) charges capacitor [C] and gives nagative (–) electric potential to point a.
(2) With the rotation of flywheel, when the primary voltage is changed into negative (wave form B), the base current IB of Tr1 (transister) begins to flow through point C, and this causes Tr1 to be ON resulting in flowing of current IC . At this moment, the capacitor begins to discharge and this causes the base current IB of Tr2 (transistor) to flow resulting in switch–ON of Tr2. The switch–ON of Tr2 also causes current I1 to flow and consequently the main current IC and current I1 are increased together.
(3) The electric potential at point b is too low to turn on SCR at point d. Also at this moment capacitor C is reversely charged, thus the potential at point a becomes possitive. As the flywheel continues to rotate, no capacitor discharge occurs even at the peak point of the wave form B causing high positive potential at point a, and therefore, the voltage across Tr2 base is lowered resulting in switch–Off of Tr2.

(4) Thus current I1 ceases flowing, then potential at point b becomes high, thereby the SCR conducts current (turns on) by entering the gate of a signal current from point d.

(5) The potential at point C is lowered by this turning on of SCR, and consequently current IB which has been flowing into Tr1 changes its path and flows to the SCR because its resistance in this state is less than that of Tr1. Accordingly Tr1 is turned off and current IC is interrupted rapidly (when the point is opened), thus high voltage is generated in the secondary coil of the ignition coil due to mutual indiction, and spark occurs at the spark plug.

The above mentioned expertise is summarized as follows: MTI unit functions in the same way as the conventional contact-points by means of combining various characteristics of the semiconductors. Therefore, when a signal enteres into the thyrister (SCR), the primary circuit is shut off (In point ignition system, at this moment, the point is opened) then high voltage is generated in the secondary coil resulting occurance of spark at the spark plug.

## 6.5 Spark plug

The spark plug is used for igniting the airfuel mixture sucked into the cylinder with a spark generated between its center electrode and ground electrode. If electrodes are burnt or carbon of excessive amount is deposited on the electrodes surfaces, starting failure and reduced output will result. Therefore the spark gap, should be adjusted to the suitable value.

(1) Spark gap ..... $0.7^{0}_{-0.1}$ mm
(allowable limit 0.8 mm)

(2) Tightening torque .... 1.2 kg·m
Intervals of spark gap check:
every 50 hours of operation.

(3) Spark plug to be used
NGK BM–6A

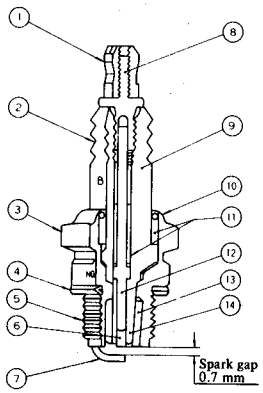



Fig. 55

(4) Names of each position

| Symbol | Part Name | Structure |
|---|---|---|
| 1 | Terminal nut | Spark plug cap can be inserted in this nut. This nut is tightened to male screw securely. |
| 2 | Courrugation (rib) | Corrugation is employed for preventing flashover. |
| 3 | Metal shell | Clamping portion is hexagon head whose dimensions are specified by JIS (Opposit side of BM-6A: 19 mm). |
| 4 | Gasket | Gasket is tightened with standard mounting torque and this gasket is applied to make seal for combustion gas leakage. |
| 5 | Mounting screw | This screw is used for cylinder head and its dimension is M14 mm. |
| 6 | Center electrode | Thses electrodes in special alloy are applied to resist against chemical corrosion and spark consumption. |
| 7 | Ground electrode | |
| 8 | Male screw | This screw is built into insulator, and is a fixing screw for terminal nut. |
| 9 | Insulator (head) | This is an insulator made of fine quality alumina and has superior properties such as voltage resistance, corrosion resistance, mechanical strength, thermal conductivity and thermal shock resistance. |
| 10 | Gland (part) | This gland is used for tightening metal shell to maintain airtightness. |
| 11 | Filler powder | Powder sealing will not cause leakage under high pressure and its mechanical strngth is high. |
| 12 | Copper core | A copper core is inserted in the center electrode to improve thermal conductivity of the ignition portion. |
| 13 | Gas circulation space | Gas which circulates in this space has major influence on temperature of spark plug. |
| 14 | Insulator (leg) | High alumina insulator, same as 9. |

(5) Mounting and dismounting spark plug.
The plug is connected to the secondary winding of the ignition coil.
If the spring is inserted incompletely into the plug terminal, heat is generated at the contact points between them and this will cause pin holes on the rubber surface and they might induce the accident of electrical shock. Therefore install the plug cap securely by the following procedures.

○ When inserting the cap, it should not only be pressed, but be inserted with screwing it clockwise. And screwing it unticlockwise when dismounting.

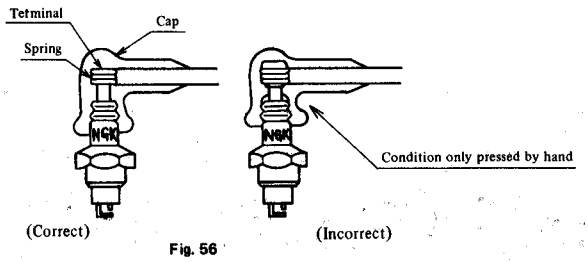



Fig. 56

## 7. Fan

The cooling fan has 16 blades and its total weight is designed to keep the center of gravity of the engine at a optimal position for reducing vibration when the engine is coupled with powered-equipment.
Therefore if cooling fan is damaged by mistake at overhavling, replace the entire fan assembly with a new one. If damaged fan is used, it will cause unsteadiness of the rotation and the main bearing might be worn out.
Notice there is no interchangeability among the fans of these three models.

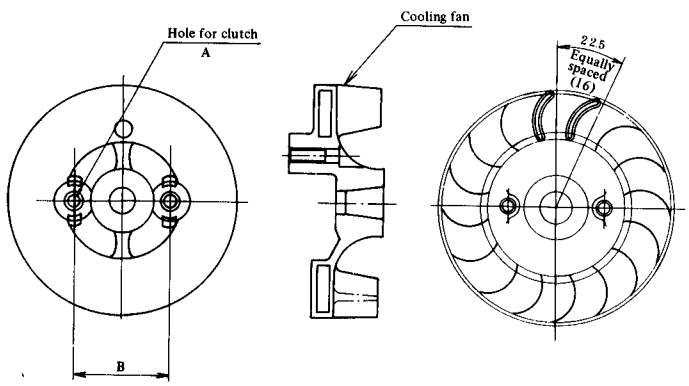



Fig. 57

A = T110P · T140P : M6
T180P : M8

B = T110P · T140P : 33 mm
T180P : 52 mm

# 8. Overhaul

## 8.1 Tools

| No. | Name | Remark |
|---|---|---|
| 1 | Dial gauge | |
| 2 | Micrometer | |
| 3 | Cylinder gauge | |
| 4 | Feeler gauge | |
| 5 | Torque wrench | |
| 6 | Coil tester | |
| 7 | Magnet stand | |
| 8 | V-block | |
| 9 | MTI unit checker | |
| 10 | Flywheel puller | |
| 11 | Tachometer | |
| 12 | Pressure gauge | |
| 13 | Float lever height gauge | |
| 14 | T socket wrench | 4 mm 5 mm |
| 15 | Phillips screw driver | Medium, large |
| 16 | Screwdriver | Medium |
| 17 | Long nose plier | |
| 18 | Ratchet wrench | Large, small |
| 19 | Socket | 8. 10. 13. 17 |
| 20 | Spanner | 8× 10 |
| 21 | Spark plug wrench | 19 |
| 22 | Extension Bar | |
| 23 | Screwdriver ⊖ (Small) | For stop watch |
| 24 | THREE BOND | # 1215<br>1405D |
| 25 | Hammer | |
| 26 | Oil | |
| 27 | L type allen wrench | 4 mm 5 mm |
| 28 | Plier | |

General Tools Order from

Mitsubishi warehouse
Mt. Prospect, Ill.
John Wellman
312-827-9273

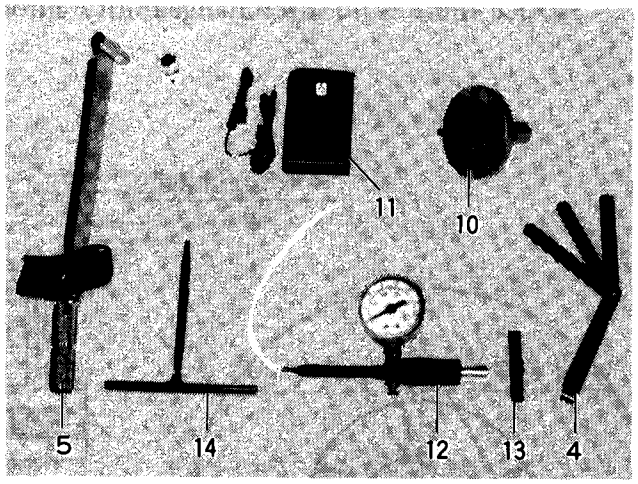



**Fig. 58**

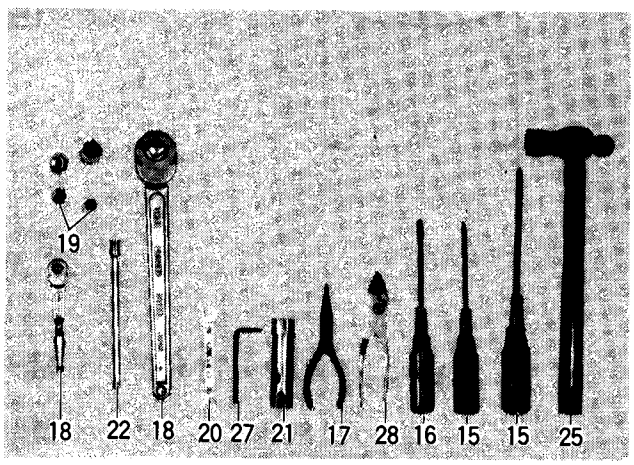
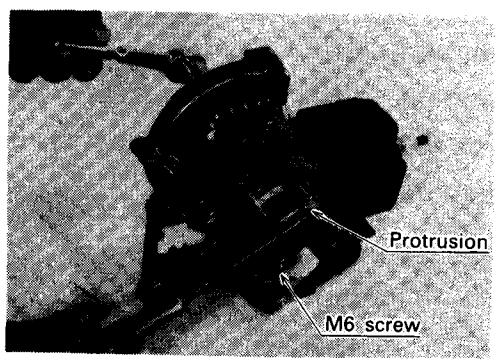
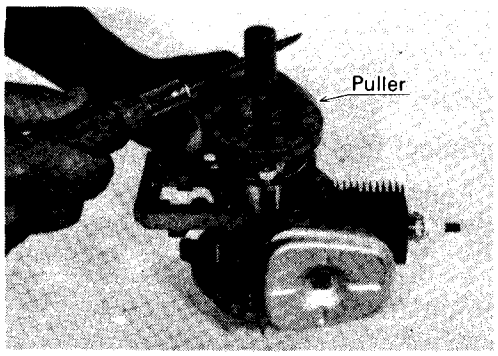



**Fig. 59**

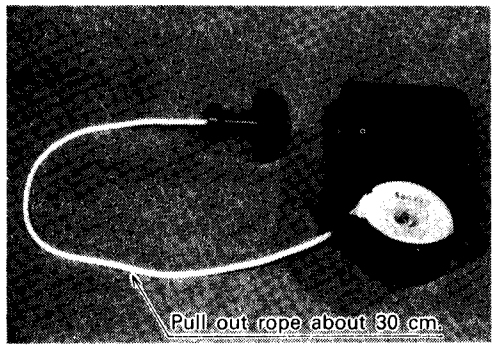
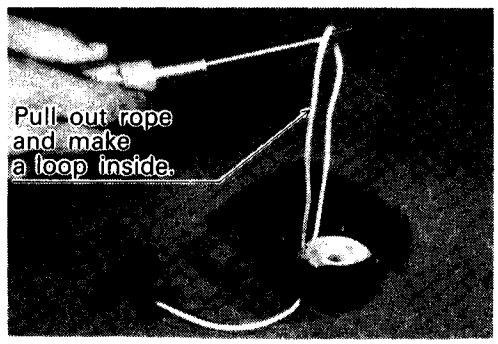
## 8.2 OVERHAUL

### 8.2.1 Disassembly procedure

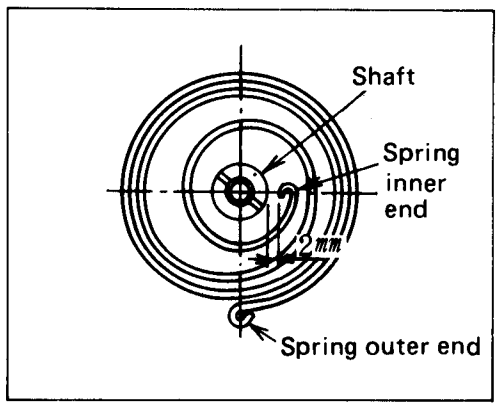
| Process | | Disassembly procedure | Tool |
|---|---|---|---|
| 1 | Top cover | 1. Dismount spark plug cover and spark plug.<br>2. Dismount top cover.<br>3. Dismount spark plug | Phillips type screwdriver (hereafter called ⊕ screwdriver)<br>19 socket wrench |
| 2 | Carburetor | 1. Dismount air cleaner.<br>2. Disconnect fuel pipe at carburetor side.<br>3. Dismount carburetor with throttle wire together.<br>4. Dismount insulator. | ⊕ screwdriver |
| 3 | Fan case (Clutch case) | 1. Dismount fan case. (clutch case)<br>2. Dismount fuel tank. | ⊕ screwdriver |
| 4 | Recoil starter | 1. Dismount recoil starter assembly | |
| 5 | Ignition coil | 1. Dismount ignition coil with MTI unit and stop switch<br>2. Dismount stop switch from ignition coil (plate is come-off at same time)<br>3. Dismount MTI unit from ignition coil | 8 socket<br>Ratchet (small)<br>⊖ screwdriver<br>⊕ screwdriver |
| 6 | Centrifugal clutch | 1. Dismount clutch.<br>  <br><br>**Fig. 60**<br>2. Screw in M6 pan screw to 6$\phi$ tapped hole, and fit screwdriver between protrusion of flywheel and the screw to prevent flywheel from turning. | 13 socket<br>Ratchet wrench<br>⊖ screwdriver<br>17 socket<br>(T180) |

| | Process | Disassembly procedure | Tool |
|---|---|---|---|
| 7 | Ply wheel and fan<br><br>**Caution**<br>Unscrew tightening nut until the nut flush with the screw of crankshaft when pulling out of flywheel and fan.<br>If fan or flywheel is pulled without this nut, the screw of crankshaft will damaged due to the force of puller. | 1. Dismount fan tightening nut.<br>Procedure: Perform in the same manner as dismounting clutch<br>2. Dismount flywheel tightening nut.<br>  <br><br>**Fig. 61**<br>○ Fit screwdriver between mounting bosses of the clutch to prevent flywheel from turning.<br>3. Draw flywheel and fan with puller. | 10 socket<br>Ratchet<br>⊖ screwdriver<br><br>Puller |
| 8 | Muffler | 1. Dismount muffler cover, then plate (muffer)<br>2. Dismount muffler body (gaskets are come off at the same time. One is heat insulator).<br>3. Dismount muffler bracket. | 8 spanner<br>10 socket<br>Ratchet |
| 9 | Cylinder | Dismount cylinder<br>T110 T140 = M6<br>T180 = M5 | T-allen wrench |
| 10 | Case | 1. Disassembly cases.<br>2. Dismount crankshaft. | ⊕ screwdriver |
| 11. | Piston | 1. Remove piston-pin crip.<br>2. Dismount piston-pin.<br>3. Remove piston rings from piston. | Long nose plier<br>Pin bar |

### 8.2.2 Disassembly and reassembly procedures for recoil starter

| Step for disassembly | Illustration |
|---|---|
| 1. Pull out starter rope 1 about 40 cm, and grasp reel with hand so as not to return former position. (See Fig. 62)<br>2. Pull out starter rope fully to the inside of the recoil starter with a screwdriver. (See Fig. 63)<br>3. Rewind starter rope slowly until rotation stops, applying the brake on reel by hand.<br>4. Remove binding screw and gently take out reel.<br>5. Remove reel<br>Note:<br>(1) Take care not to remove reel quickly. Otherwise spiral spring may jump out from starter case. However in case of replacing the spriral spring, above disasembly procedures are need not to be followed in that order. |  <br>Fig. 62<br>  <br>Fig. 63 |

(2) Reassembling procedure

| | Step for Reassembling | Illustration |
|---|---|---|
| 1 | Hook the spiral spring end to the hook portion in the reel and wind the spring. |  <br>Fig. 64 |
| 2 | Space 2 mm between spring and shaft. | |
| 3 | Insert reel.<br>○ Check to see if hook of spiral spring is hooked correctly to the notched portion of reel by rotating reel by hand.<br>○ Apply good quality grease on the hook portion. | |

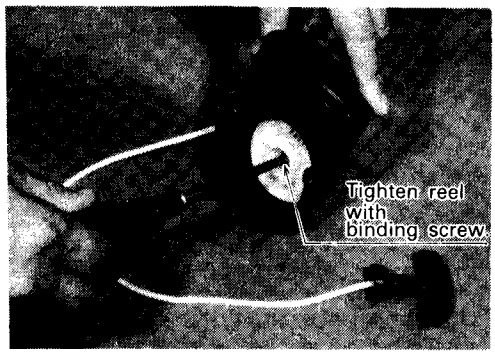
| | Step for **Reassembling** | Illustration |
|---|---|---|
| 4. | Tighten reel with binding screw.<br>○ Align washer slot with protrusion of shaft.<br>○ Apply adhesive to screw for locking (SCREWLOCK #1405D). |  |
| 5. | Pull out starter rope fully and hook the rope to the notched portion and let the rope be rewound by the force of spiral spring in the direction of arrow by seven turns, after that with reel held with fingers, pull out the rope to the outside, and then rewind the reel slowly. | |

Fig. 65

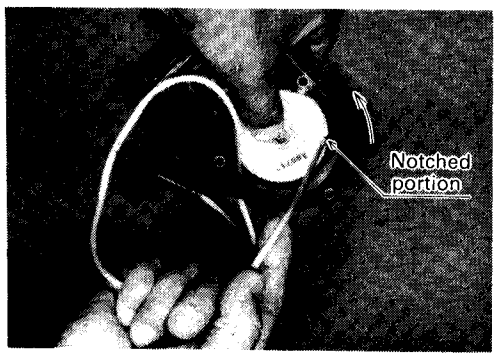



Fig. 66

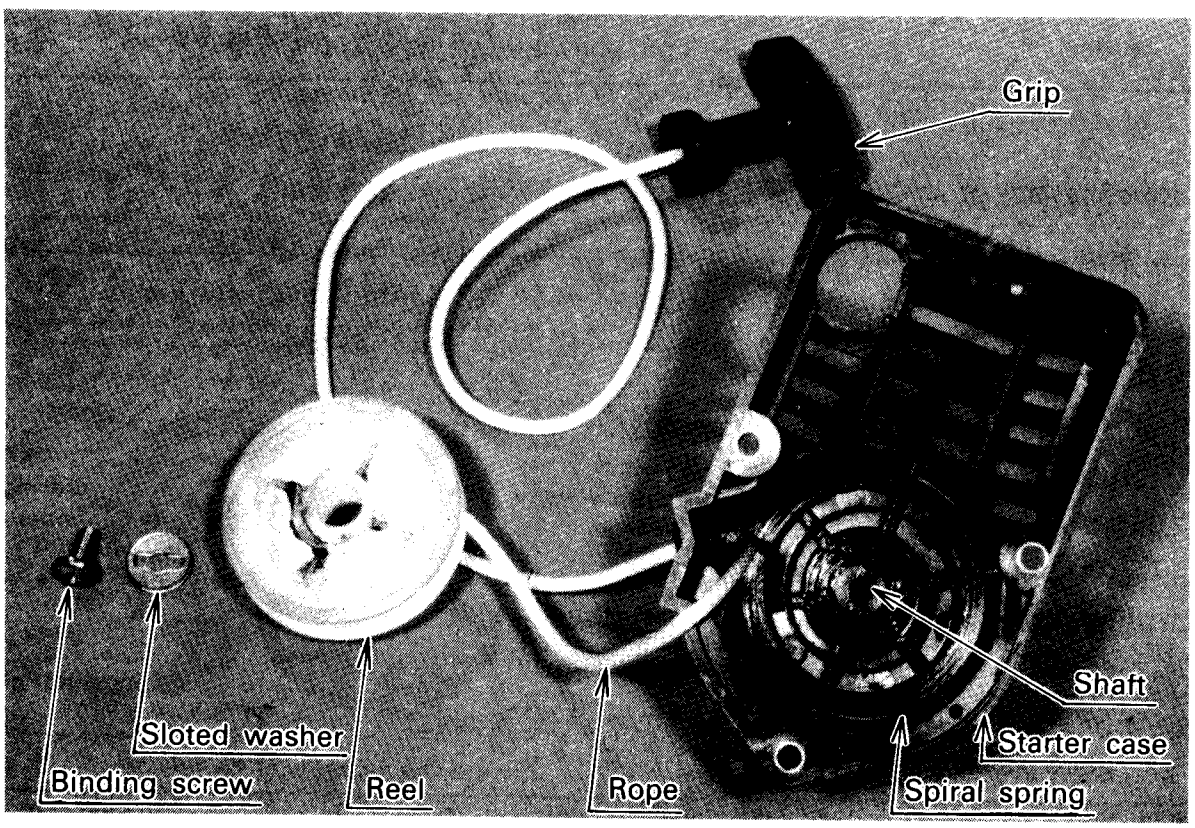



Fig. 67

### 8.2.3 Inspection and cleaning after disassembling

(1) Check all items for abnormality of parts such as moving parts, sliding parts. (piston, piston rings, cylinder, crankshaft, oil seals etc.)

○ Check points

| Phenomenon | Piston | Piston ring | Crankshaft ass'y | Cylinder | Oil seal | Bearing |
|---|---|---|---|---|---|---|
| Output shortage (Defective compression) | ○ Wear<br>○ Seizure<br>○ Scratch (scuffing) | ○ Wear<br>○ Stickings | | ○ Carbon pilling<br>○ Clogging pulse hole (Wrong main tenance) | ○ Wear of lip<br>○ Protrusion (Loose out) | |
| Internal abnormal noise | ○ Beating noise (Wear) | | ○ Wear of pin and both bearings of connecting rod | Striking sound (wear) | | ○ Wear |

(2) Clean outside of the carburetor with gasoline, overhaul and check the abnormalities of each part.

At assembling, rinse inner parts with clean gasoline and blow with compressed air. (Do not use waste cloth.) See Adjusting procedure

(3) Do not rinse the electric parts. Just wipe the dirt out with dry cloth and dry them. See Adjusting procedure

(4) As for other parts, clean sufficiently with cleaning oil.

(5) Decarbonising, inspection and maintenance

(1) Cylinder (Fig. 68)

Remove carbon deposited in the combustion chamber and exhaust port using a (−) screwdriver with care not to damage the surface of aluminium or chrome plated portion until all the aluminium surface will appear.

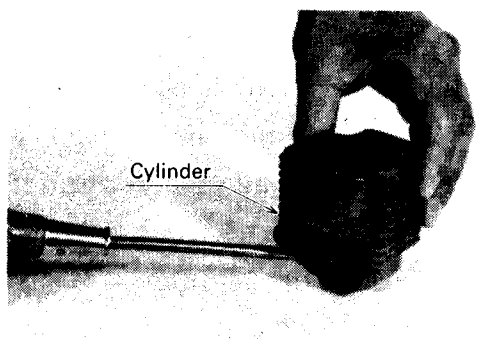



Fig. 68

(2) Piston

Repair the damage such as seizure or scratch with fine sandpaper (#400). In case the seizure or scratch is extraordinary, replace the piston with a new one.

Remove carbon deposited on the head and ring grooves with a screw driver (−).

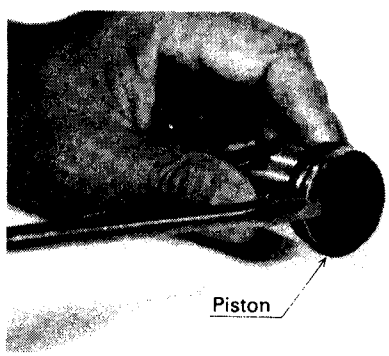



Fig. 69

(3) Muffler (Fig. 70)

Dismount muffler lid and remove carbon which is pilling at exhaust passage or inner part of the cylinder.

○ Do not disassemble the muffler body except for replacement of it.

Fig. 70

(6) Spark plug

Remove carbon pilling on the electrode and insulator with a fine driver. Especially, clean the insulator until the plate surface is revealed, and adjust the clearance between the electrodes after cleaning.

(1) Standard clearance: 0.6 to 0.7 mm

(2) When replacing the ignition plug, use NGK BM–6A.

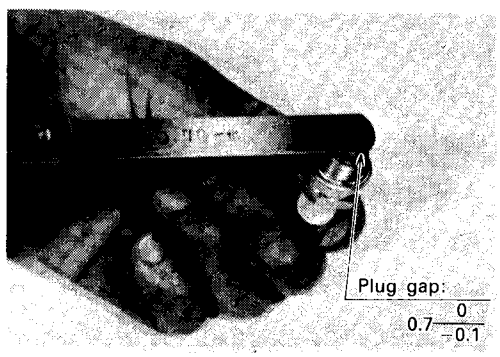



Fig. 71

(7) Cleaning of air cleaner

After washing the element with gasoline, squeeze it tightly by hand, and immerse it in engine oil, and squeeze again tightly, after that install it in the cleaner case.

(8) Cleaning of fuel filter

Take out the suction hose in the fuel tank, clean the filter which is attached on the weight of the hose and the sponge installed the inside of the filter respectively.

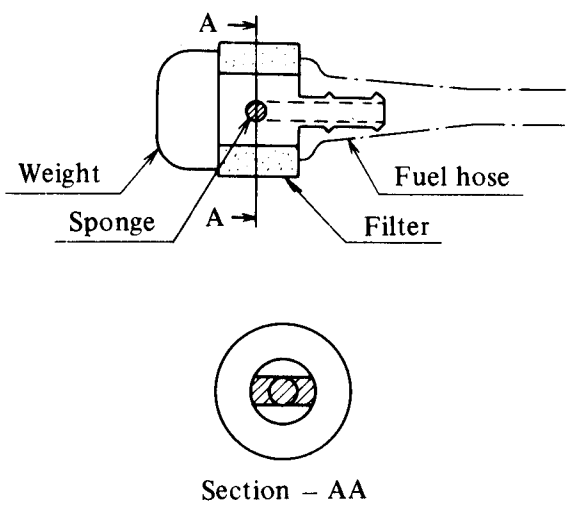



Fig. 72

## 8.2.4 List of tightening torques

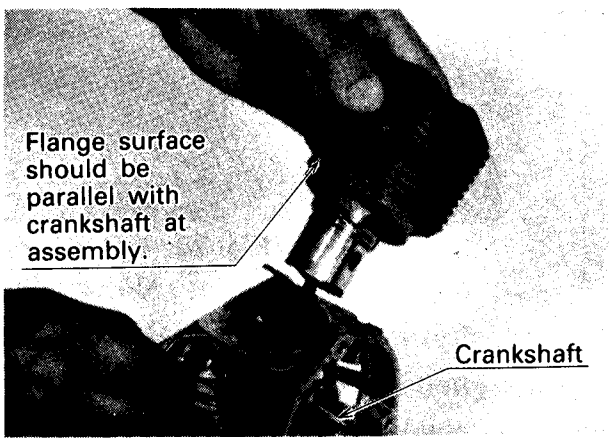
| | Item | Kinds of screws | Tightening torque (kg·m) | | |
|---|---|---|---|---|---|
| | | | T110 | T140 | T180 |
| | Crankcase | M5 pan head screw | 0.4~0.5 | ← | ← |
| | Cylinder | M6 hex. (Socket head washer faced screw) | 0.6~0.7 | ← | ← |
| | | M5 hex. socket head bolt | – | – | 0.4~0.5 |
| | Fan case | M5 pan head screw | 0.4~0.5 | ← | ← |
| ○ | Flywheel | M6 nut | 0.6~0.8 | ← | ← |
| | Insulator | M5 pan head screw | 0.3~0.4 | ← | ← |
| | Carburetor | M5 pan head screw | 0.3~0.4 | ← | ← |
| ☆ | Air cleaner cover | M4 pan head screw | 0.15~0.2 | ← | ← |
| | Recoil starter | M5 pan head screw | 0.4~0.5 | ← | ← |
| | Spark plug | M14 | 1.2 | ← | ← |
| | Ingition coil | M5 hex. bolt | 0.4~0.5 | ← | ← |
| ○ | Centrifugal clutch | Special bolt | 0.6~0.8 | ← | 0.8~1.0 |
| | MTI unit | M4 pan head screw | 0.2~0.3 | ← | ← |
| | Muffler | M6 nut | 0.6~0.8 | ← | ← |
| | Muffler cover | M5 hex. bolt | 0.4~0.5 | ← | – |
| | | M5 nut | – | – | 0.4~0.5 |
| ○ | Fan | M6 nut | 0.6~0.8 | ← | ← |
| | Other screw | M4 pan head screw | 0.2~0.3 | | |
| | | M5 pan head screw | 0.3~0.4 | | |

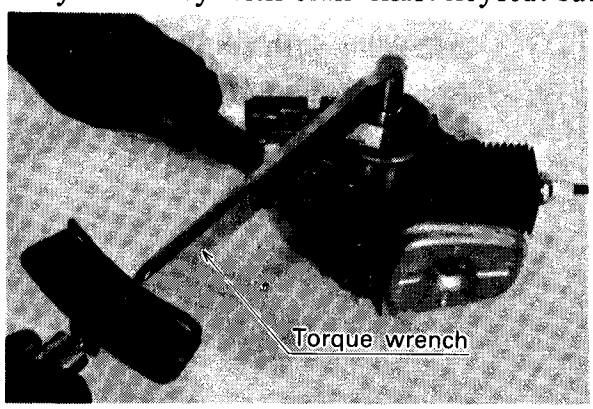
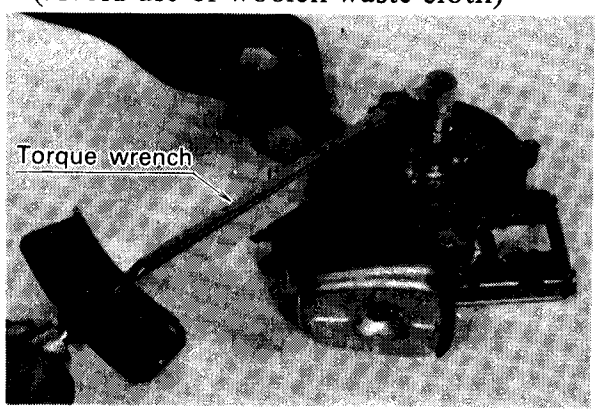
☆ mark: Be careful of tightening torque.
○ mark: Make sure to use a torque wrench.
(Becareful of nut size (6) for flywheel and fan since it has been adopted smaller sizes.

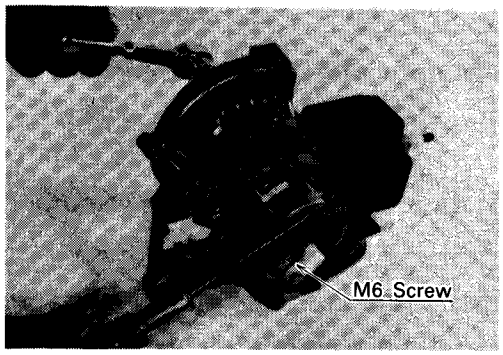
6.6 x ? = Allis.

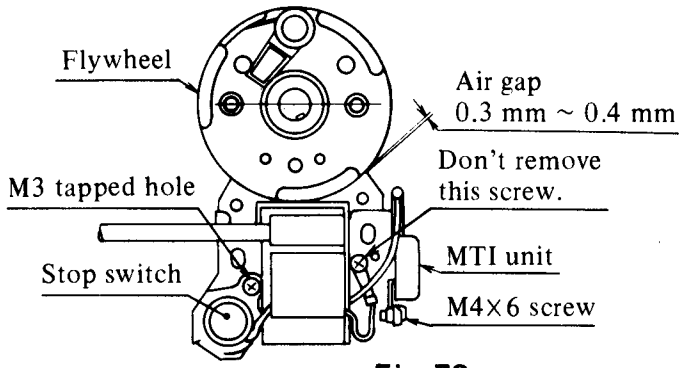
### 8.2.5 Reassembling procedure

| Step for receasembling | | Reassembly procedure | Tool |
|---|---|---|---|
| 1 | Piston | 1. Install piston ring in ring grooves. Be careful of direction of knock-pin.<br>2. Install piston to connecting rod.<br>○ Replace snap rings, if deformed.<br>○ Apply oil on the needle bearing.<br>○ Insert snap ring while it is turned with a long nose pliers.<br> <br><br>**Fig. 73** | Long nose pliers<br>Pin inserting bar |
| 2 | Crankcase | 1. Insert crankshaft into fan side case.<br>○ Position piston's convex portion so as to locate at intake side. Mark to carb. side.<br>○ Apply a small amount of oil on oil seal lip.<br>○ Apply Three Bond No. 1215 (fluid seal) on surfaces of case uniformly with fingers.<br>○ Don't apply fluid seal or sealant excessively or trouble may occur, since the excess of it will be extruded to the inside of cases and be skewed into moving parts.<br>2. Assemble starter case<br>○ Screw : M5 x 25 (3 pieces) | ⊕screwdriver<br>oil<br>Fluid seal |

| Step for receasembling | | Reassembly procedure | Tools |
|---|---|---|---|
| 3 | Cylinder | 1. Mount cylinder gasket<br>○ Place gasket on case correctly.<br>2. Install cylinder on cases.<br>○ Apply a small amount of oil to piston rings.<br>○ Place piston ring ends at knock pin position.<br>○ Install cylinder fange surface of both ports paralleing with crankshaft.<br>○ Check to see if crankshaft rotate smoothly by hand after tightening.<br>  <br><br>**Fig. 74**<br>○ Screw :<br>T110 T140 : M6 hex. socket head (2 pieces)<br>T180 : M5 hex. socket head (4 pieces) | Hex. wrench |
| 4 | Muffler | 1. Mount muffler body with gasket.<br>○ Bending side of gasket should be located toward inside.<br>○ Don't leave flange plate.<br>2. Insert insulating plate (gasket) into 2 ribs of cooling suction port.<br>3. Insert plate (silencing device) into muffler body and tighten the cover.<br>Screws M6 washer faced nut : 2 pcs<br>M5 x 25 screw : 1 pc | 10 socket<br>Ratchet<br>⊕screwdriver<br>8 spanner |

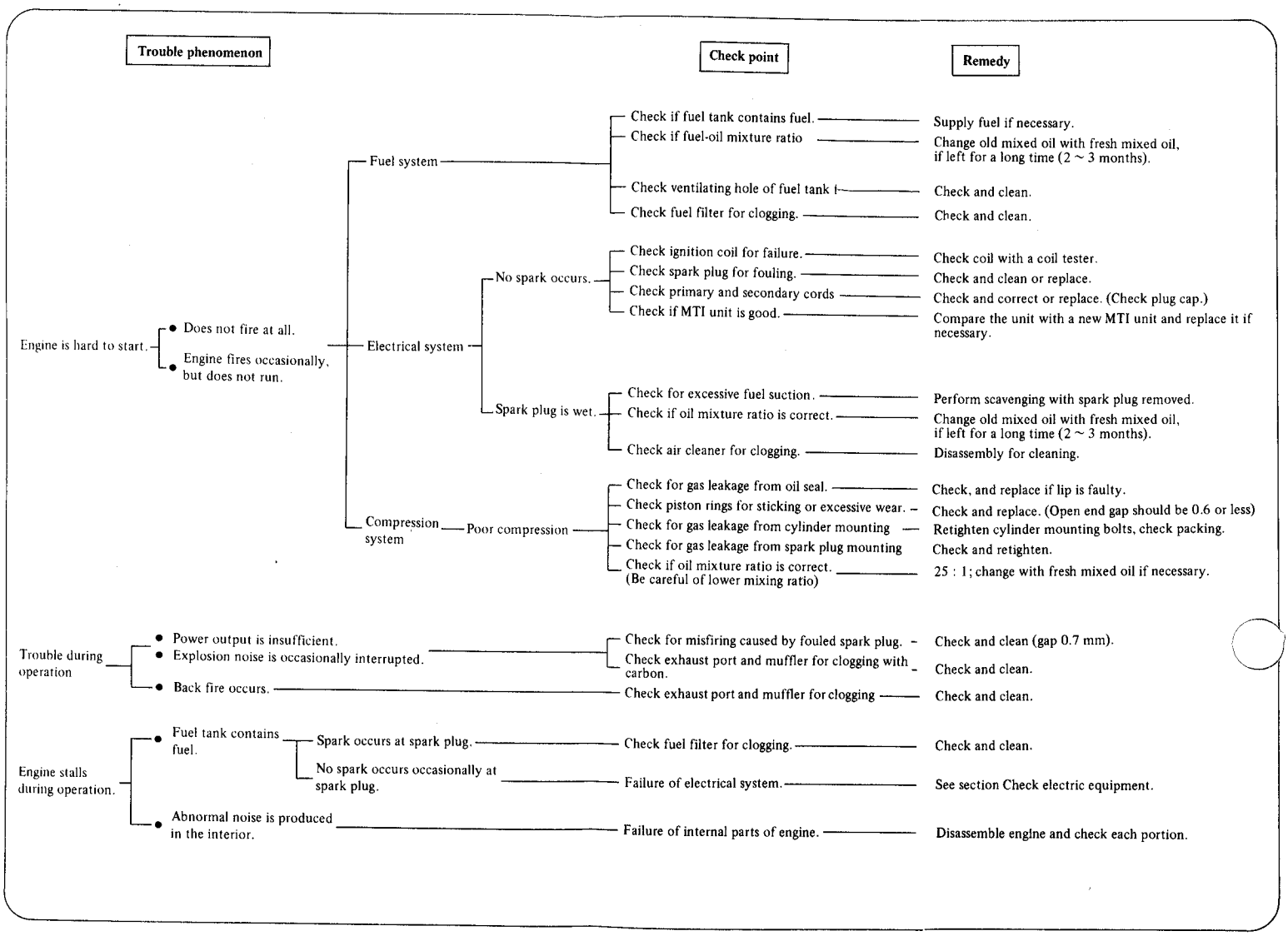
| | Step for receasembling | Reassembly procedure | Tools |
|---|---|---|---|
| 5 | Flywheel and Fan | 1. Install flywheel.<br>○ Clean tapered portion of flywheel and crankshaft.<br>(Avoid use of woolen waste cloth.)<br>○ Install flywheel on crankshaft aligning flywheel key with crankshaft keyseat surely.<br>  <br><br>**Fig. 75**<br>○ Screw in M6 bolt into M6 taped hole on flywheel, and fit a screwdriver between the bolt and flywheel's convex portion to prevent crankshaft from turning.<br>○ Using nut : M6 conical nut.<br>○ Tightening torque : 0.6 to 0.8 kg·m<br>2. Install fan<br>○ Clean tapered portion of fan and crankshaft.<br>(Avoid use of woolen waste cloth)<br>  <br><br>**Fig. 76**<br>○ Screw in two M6 bolts into M6 tapped holes on flywheel and fit a screwdriver between bolts to prevent crankshaft from turning.<br>○ Using nut : conical nut<br>○ Tightening torque : 0.6 ~ 0.8 kg·m | Ratchet<br>10 socket<br>Screwdriver<br>Torque wrench<br>M6 x 25 bolt |

| Step for receasembling | | Reassembly procedure | Tools |
|---|---|---|---|
| 6 | Centrifugal clutch | Install certrifugal clutch assembly.<br>○ Place weight's cast " " mark surface facing upward.<br>○ Be careful to avoid forgetting plain washers.<br>  <br><br>**Fig. 77**<br>○ Apply adhesive on screw. However, never apply it on sliding portions such as clutch weight, fitting bolt, and washer etc..<br>○ Screw two M6 bolts into M6 tapped holes on flywheel and fit a screwdriver between the bolts to prevent flywheel from turning.<br>○ Using bolts: (FR66747) bolts (2 pieces)<br>○ Tightening torque: 0.6 ~ 0.8 kg·m<br>Tightening torque: 0.8 ~ 1.0 kg·m (T180P) | Ratchet<br>13 socket<br>Screwdriver<br>Torque wrench<br>M6 x 25 bolt<br>THREE BOND<br>#1405D<br>17 socket<br>(T180) |
| 7 | Ignition coil | 1. Connect lead wire and stop switch.<br>2. Install stop switch together with bracket onto iron core.<br>3. Mount MTI unit using screw M4 x 6 (1 pc)<br>4. Insert 0.3 mm thickness paper between flywheel and iron core coil and press the coil and tighten it with bolts. | ⊖ screwdriver<br>⊕ screwdriver<br>8 socket<br>Ratchet (small) |

| Step for receasembling | | Reassembly procedure | Tools |
|---|---|---|---|
| | Air gap:<br>0.3 ~ 0.4 mm |  <br><br>**Fig. 78**<br>○ Using screw : M5 × 25 (2 pc)<br>5. Insert high voltage wire grommet into case. | |
| 8 | Fan case<br>(Clutch case) | Insert fuel tank into starter side case, and install fan case (Clutch case)<br>○ Be carefuel to avoid forgetting pad (rubber).<br>○ Using screw : M5 × 20 without washer screw (3 pcs) | ⊕ screwdriver |
| 9 | Recoil starter | Mount recoil starter<br>○ One screw is used for tightening together with top cover<br>○ Using screw : M5 × 20 screw (3 pcs) | ⊕ screwdriver |
| 10 | Carburetor | 1. Mount insulator<br>○ Be careful of direction of installing packing<br>○ Using screw : M5 × 20 spring washer, screw (2 pcs)<br>2. Mount carburetor<br>○ Be careful of direction of installing packing<br>○ Using screws M4 × 25 screw (2 pcs)<br>3. Insert fuel pipe<br>4. Mount air cleaner<br>○ Using screw M4 × 25 screw (2 pcs) | ⊕ screwdriver |

# 210 & 240 TRIMMER ENGINE SERVICE MANUAL

TROUBLESHOOTING


Trouble phenomenon
Check point
Remedy
Engine is hard to start.
Does not fire at all.
Engine fires occasionally, but does not run.
Fuel system
Check if fuel tank contains fuel.
Supply fuel if necessary.
Check if fuel-oil mixture ratio
Change old mixed oil with fresh mixed oil, if left for a long time (2 ~ 3 months).
Check ventilating hole of fuel tank f
Check and clean.
Check fuel filter for clogging.
Check and clean.
Electrical system
No spark occurs.
Check ignition coil for failure.
Check coil with a coil tester.
Check spark plug for fouling.
Check and clean or replace.
Check primary and secondary cords
Check and correct or replace. (Check plug cap.)
Check if MTI unit is good.
Compare the unit with a new MTI unit and replace it if necessary.
Spark plug is wet.
Check for excessive fuel suction.
Perform scavenging with spark plug removed.
Check if oil mixture ratio is correct.
Change old mixed oil with fresh mixed oil, if left for a long time (2 ~ 3 months).
Check air cleaner for clogging.
Disassembly for cleaning.
Compression system
Poor compression
Check for gas leakage from oil seal.
Check, and replace if lip is faulty.
Check piston rings for sticking or excessive wear.
Check and replace. (Open end gap should be 0.6 or less)
Check for gas leakage from cylinder mounting
Retighten cylinder mounting bolts, check packing.
Check for gas leakage from spark plug mounting
Check and retighten.
Check if oil mixture ratio is correct. (Be careful of lower mixing ratio)
25 : 1; change with fresh mixed oil if necessary.
Trouble during operation
Power output is insufficient.
Explosion noise is occasionally interrupted.
Check for misfiring caused by fouled spark plug.
Check and clean (gap 0.7 mm).
Check exhaust port and muffler for clogging with carbon.
Check and clean.
Back fire occurs.
Check exhaust port and muffler for clogging
Check and clean.
Engine stalls during operation.
Fuel tank contains fuel.
Spark occurs at spark plug.
Check fuel filter for clogging.
Check and clean.
No spark occurs occasionally at spark plug.
Failure of electrical system.
See section Check electric equipment.
Abnormal noise is produced in the interior.
Failure of internal parts of engine.
Disassemble engine and check each portion.

**SNAPPER POWER EQUIPMENT**
McDonough, Georgia 30253
**A Division of Fuqua Industries**